

INDEX

VOLUME II

Record Appendix
Page Page

Commission Exhibit No. 3—Theoretical Possibilities and Consequences of Major Accidents in Large Nuclear Power Plants, March 1957 . . .	4852-4857	349-356
	4885-4887	356-359
	4889-4892	359-363
Original Application for License by PRDC	5116-5127	364-381
Original Application Exhibit I—Proposal submitted March 30, 1955	5129-5133	381-387
Application Exhibit III—Articles of Incorporation of Power Reactor Development Company, a Non-Profit Organization organized under the Laws of the State of Michigan	5137-5144	387-394
Amendment No. 5 to Application for License	5410-5412	395-398
Application Exhibit XXI—Agreement between Power Reactor Development Company and Atomic Power Development Associates, Inc.	5435-5441	398-408
Application Exhibit XXII—Loan Agreement	5442-5451	409-444

II.

*Record
Page*

*Appendix
Page*

Application Exhibit XXIV—Contribution Commitment Letters from PRDC Members; Only One Sample Printed	5474	444-445
Amendment No. 7 to Application for License:		
Application Exhibit XXVII—PRDC Enrico Fermi Atomic Power Plant Project Construction Estimate	5529-5535	446-453
Application Exhibit XXVIII—Power Reactor Development Company Enrico Fermi Atomic Power Plant Project Statement of Source and Application of Cash During Construction Period	5536-5542	454-460
Application Exhibit VII-B—Special Nuclear Materials—Required and Produced—Weekly Subassembly Removal Program	5918-5919	461-462
Application Exhibit XXXVI—Contribution Commitment Letter from PRDC Members for Year 1961; Only One Sample Printed	5921	463
Application Exhibit XXXIX—Internal Revenue Service Tax Ruling Letter	6046-6050	464-471
Application Exhibit XI ^A —Calculation of Plutonium Revenue (Sheet 3)	6062	473

III.

*Record
Page*

*Appendix
Page*

Application Exhibit XLII—Letter,
dated July 19, 1957, *re*: Enrico
Fermi Atomic Power Plant Re-
vised Schedule of Plant Costs. . . . 6063-6064 475-477

Application Exhibit XLIII—Power
Reactor Development Company En-
rico Fermi Atomic Power Plant
Project Statement of Source and
Application of Cash During Con-
struction Period Prepared in Ac-
cordance with Preliminary Revised
Construction Schedule, July 19,
1957 6065-6069 478-482

Application Exhibit XLIV—Power
Reactor Development Company En-
rico Fermi Atomic Power Plant
Project Statement of Source and
Application of Cash During Ten
Year Operating Period Following
Completion of Construction and
Testing in Accordance with Prelim-
inary Revised Construction Sched-
ule, July 19, 1957 6070-6078 483-491

Application Exhibit XLV—Power
Reactor Development Company
Comparison of Construction Esti-
mates and Commitments (Direct
Costs Only) 6079-6082 492-496

Application Exhibit XXI-A—Sup-
plement to APDA-PRDC Agree-
ment 6273 497-498

IV.

	<i>Record Page</i>	<i>Appendix Page</i>
Application Exhibit XXII-A—Guar- anty Agreement	6274-6280	498-510
Application Exhibit XLI-A—Costs..	6288-6289	511-512
Letter from H. L. Price, August 4, 1956	6290-6291	513-515
Construction Permit, August 4, 1956	6292-6297	516-523
UAW Petition for Intervention....	6298-6316	524-542
UAW and Paperworkers Petition for Intervention	6317-6336	542-570
PRDC Answer to UAW Petition....	6340-6343	571-575
Notice of Hearing, Order and Memp- randum, October 8, 1956	6358-6372	576-593
Intervenors' Answer to Order of Commission	6386-6390	593-600
PRDC Answer to Order of Commis- sion	6392-6395	600-604
Commission's Order Extending Time for Submission of Financial Infor- mation, August 8, 1957	6660-6661	605-607
Findings and Decision of Commis- sion, December 10, 1958	6873-6894	607-629
Commission's Opinion, Final Deci- sion and Order, May 26, 1959.....	6933-7033	630-720

[4852]

Commission Exhibit No. 3.**UNITED STATES ATOMIC ENERGY COMMISSION,**

Washington 25, D. C.

United States

Atomic Energy Commission

THEORETICAL POSSIBILITIES AND CONSEQUENCES OF MAJOR ACCIDENTS IN LARGE NUCLEAR POWER PLANTS, MARCH 1957

[4853]

UNITED STATES**ATOMIC ENERGY COMMISSION**

Washington 25, D. C.

(Seal)

March 22, 1957

Dear Mr. Durham:

There is transmitted herewith a report of a study of the possible consequences in terms of injury to persons and damage to property, if certain hypothetical major accidents should occur in a typical large nuclear power reactor.

More than two score leading experts in the sciences and engineering specialties participated in this study.

We are happy to report that the experts all agree that the chances that major accidents might occur are exceedingly small.

This study constitutes a part of the Commission's continuing effort on a broad front to understand and resolve this

problem of possible reactor hazards so that we may proceed with an expanding atomic energy industry with full confidence that there will be few reactor accidents and that such as do occur will have only minor consequences. This effort and the work of translating the results into affirmative, concrete safeguards for protection of the public will, of course, be continued and expanded.

Since the beginning of the reactor program the experts and the Congress and the public and the Commission have all been concerned with the causes of and the possible magnitude of damage from reactor accidents and with means of prevention. The subject was considered important enough to command four of the 60-odd sessions of the International Conference on the Peaceful Uses of Atomic Energy in Geneva eighteen months ago, which, as you will recall, we initiated. One conference paper in particular gave estimates of the theoretical magnitude of damage. In May of last year, Dr. Libby presented to your Committee some estimations of the possible extent of harm and damage should a major accident occur.

This study has taken the form in which it is now presented to you as a means of responding to the Committee's specific request of last July 6. To produce such a study, it was necessary to stretch possibility far out toward its extreme limits. Some of the worst possible combinations of circumstances that might conceivably occur were included

[4854]

in the hypotheses in order that we might assess their consequences. The study must be regarded only as a rough estimation of the consequences of unlikely though con-

ceivable combinations of failure and error and weather conditions; it is not in any sense a prediction of any future condition.

This has been a difficult study to make. There has fortunately been little reactor accident experience upon which to base estimates. Nuclear reactors have been operated since December 2, 1942, with a safety record far better than that of even the safest industry. More than 100 reactor years of regular operating experience have been accumulated, including experience with reactors of high power and large inventories of fission products, without a single personal injury and no significant deposition of radioactivity outside of the plant area. There have been a few accidents with *experimental* reactor installations as contrasted with the perfect record of safety of the regularly operating reactors. But even these accidents did not affect the public.

This record which shows that safe operation can be achieved is due to skillful design, careful construction, and competent operation.

Looking to the future, the principle on which we have based our criteria for licensing nuclear power reactors is that we will require multiple lines of defense against accidents which might release fission products from the facility. Only by means of highly unlikely combinations of mechanical and human failures could such releases occur. Furthermore, the Government and industry are investing heavily in studies to learn more about the principles of safe reactor design and operation.

Framing even hypothetical circumstances under which harm and damage could occur and arriving at estimations

of the theoretical extent of the consequences proved a complex task.

To make the study we enlisted the services of a group of scientists and engineers of the Brookhaven National Laboratory and of another group of experts to serve as a steering committee. Through recent months these men have met with many additional expert advisors to test our judgments on the estimates arrived at.

We are not aware of such a study having been undertaken for any other industry. We venture to say that if a similar study were to be made for certain other industries, with the same free rein to the imagination,

[4855]

we might be startled to learn what the consequences of conceivable major catastrophic accidents in those other industries could be in contrast with the actual experience in those industries.

Remembering that this study analyses theoretical possibilities and consequences of reactor accidents, we might note here the judgments presented on (1) possible consequences of major accidents and (2) the likelihood of occurrence of such major reactor accidents.

The portion of the study dealing with consequences of theoretical accidents started with the assumption of a typical power reactor, of 500,000 kilowatts thermal power, in a characteristic power reactor location. Accidents were postulated to occur after 180 days of operation, when essentially full fission product inventories had been built up.

Three types of accidents which could cause serious public damages were assumed. Pessimistic (higher hazard) values were chosen for numerical estimates of many of the uncertain factors influencing the final magnitude of the estimated damages. It is believed that these theoretical estimates are greater than the damage which would actually occur even in the unlikely event of such accidents.

For the three types of assumed accidents, the theoretical estimates indicated that personal damage might range from a lower limit of none injured or killed to an upper limit, in the worst case, of about 3400 killed and about 43,000 injured.

Theoretical property damages ranged from a lower limit of about one half million dollars to an upper limit in the worst case of about seven billion dollars. This latter figure is largely due to assumed contamination of land with fission products.

Under adverse combinations of the conditions considered, it was estimated that people could be killed at distances up to fifteen miles, and injured at distances of about forty-five miles. Land contamination could extend for greater distances.

In the large majority of theoretical reactor accidents considered, the total assumed losses would not exceed a few hundred million dollars.

[4856]

As to the probabilities of major reactor accidents, some experts held that numerical estimates of a quantity so vague

and uncertain as the likelihood of occurrence of major reactor accidents have no meaning. They declined to express their feeling about this probability in numbers. Others, though admitting similar uncertainty, nevertheless ventured to express their opinions in numerical terms. Estimations so expressed of the probability of reactor accidents having major effects on the public ranged from a chance of one in 100,000 to one in a billion per year for each large reactor. However, whether numerically expressed or not, there was no disagreement in the opinion that the probability of major reactor accidents is exceedingly low.

Some of the reasons for this belief follow:

First, industry and government are determined to maintain safety and protect the health and property of the public from nuclear hazards. The Congress has authorized and we in the Commission are carrying out a program of close and careful regulation and inspection. Thus the potential hazard of this new industry has been recognized in advance of its development and brought under a strict system of safety control before the occurrence of the incidents which in other fields have marked the birth of new industry and have subsequently led to control.

Secondly, the challenge of this new and important venture in man's application of the forces of nature has attracted able and energetic men into the work of assuring safe design and operation.

In the third place, multimillion dollar efforts in research and development, both public and private, are directed toward identifying and solving safety problems. We know of no other industry where so much effort has been and is

being spent on the definition and solution of safety problems.

Fourthly; the cost to the industry and government of reactor accidents, even of a minor nature, would be very high—much higher than for accidents in other industry. Self-interest, therefore, as well as public interest dictates avoidance of accidents.

To sum up, the report affirms that a major reactor accident is extremely unlikely. To reduce the matter of assumed hazards to comparative numbers, let us take the most pessimistic assumptions used and apply them to a case of 100 power reactors in operation in the United States.

[4857]

Under these assumptions, the chances of a person being killed in any year by a reactor accident would be less than one in 50 million. By contrast the present odds of being killed in any year by an automobile accident in the United States stand at about one in 5,000.

We are not surprised by the contents of the report nor are we made complacent. The report serves to identify areas where continued research and development are needed, and areas where emphasis is needed in the further development of our regulatory program. It gives renewed emphasis to our belief that our research and development program and our regulatory program in the nuclear power field must continue with vigor to the end that the "conceivable" catastrophe shall never happen.

We would appreciate your regarding the attachment as an "advance" report. It is being reviewed for editorial

and mechanical errors and omissions. Copies of the report as corrected will be furnished to you at an early date.

Sincerely yours,

/S HAROLD S. VANCE

Acting Chairman

Enclosure:

•Theoretical Possibilities
and Consequences of Major Accidents
in Large Nuclear Power Plants"

Honorable Carl T. Durham
Chairman, Joint Committee on
Atomic Energy
Congress of the United States

[4885]

Degrees of Land Contamination

By far the largest dollar cost to the public of a major reactor accident would result from contamination of land areas by deposited fission products. Inhabitants of portions of the areas affected would have to be evacuated to avoid serious exposure. Access to various areas might be denied for different lengths of time, and the subsequent use of land for agricultural purposes might be curtailed, with possible loss of standing crops. The same basic exposure-injury criteria listed above (column 1) were used also for determining the consequences of land contamination. Details of calculations are shown in Appendix D. In the case of land contamination, the existence of specific isotopes especially strontium⁹⁰, must be considered

very carefully. The severe restrictions that might be imposed on farming arise almost entirely from the existence of this particular isotope.

To estimate the potential loss arising from problems of land contamination both the number of persons and the area affected were calculated. In some instances the costs were evaluated by associating them with an average cost per person. In the particular cases associated with farm restriction an average cost per square mile was used

[4886]

The categories chosen, and costs assumed for each are:

Range I.	Evacuation of personnel— immediate	\$5000/person
Range II.	Evacuation of personnel— orderly and in a reasonable time	\$5000/person
Range III.	Restrictions on land and out- door activity	\$ 750/person
Range IV.	Crop and farm restriction ..	\$25,000/sq. mile

The criteria used in establishing these ranges are described in Appendix D. It should again be emphasized that they are based on meager data.

REACTOR ACCIDENTS ASSUMED

Three types of reactor accidents were considered necessary for this study in order to indicate the range of public hazard which could result and to delineate the influence of the important variables as described above on the mag-

nitude of these hazards. The three "typical" cases selected are:

A. *The Contained Case*

In this accident, it is assumed that all of the fission products from the 500,000 Kw (thermal) reactor, after 180 days of operation, are released from the core and distributed uniformly throughout the interior of the containment building. None is assumed to escape. The fission products are assumed to decay at their natural rate, with no attempt at decontamination, etc., after the accident. Hazard to the public

[4887]

would arise from the direct gamma radiation from the fission products dispersed inside the containment building. One inch of steel shielding by the walls of the building is assumed. The site boundaries are 2000 feet from the reactor.

B. *The Volatile Release Case*

In this case it is assumed that all of the volatile fission products in the reactor (500,000 Kw (thermal) after 180 days), i.e., xenon, krypton, iodine, bromine and 1% of the strontium are released from the containment building and are subsequently dispersed, with characteristics and meteorological conditions as described and specified above. See Appendix A.

C. *The 50% Release Case*

In this case, it is assumed that 50% of all fission products in the reactor (500,000Kw (thermal) after 180 days) are released from the containment building and are subsequently dispersed, with characteristics and meteorological conditions as described and specified above. See Appendix A.

Each of these arbitrary cases represents a highly pessimistic assumption. Certainly more catastrophic releases of the Contained and the Volative types are not possible. In the third type, it is conceivable that more than 50% of all fission products could be released, but this is considered to be so far in the realm of incredibility as not to merit consideration.

[4889]

ESTIMATED CONSEQUENCES OF THE ASSUMED REACTOR ACCIDENTS

In this part of the report, there is presented a brief summary of the calculated damages obtained from each of the assumed accidents, together with brief observations and pertinent comments on the results obtained in the respective cases. Reference is made to Appendices H and I, of Part IV, for more complete tabulation of results.

CASE I—THE CONTAINED CASE

The assumption is made that all of the fission products are vaporized and dispersed within the contain-

ment shell. There is no release to the atmosphere. Damage to the public would then result from direct exposure to gamma radiation. The following tabular summary shows personal injuries and evacuation costs beyond the 2000 feet boundary of the reactor site.

	<i>Personal Injury</i>	
	<i>Assuming evacuation in 2 hours (persons)</i>	<i>Assuming evacuation in 24 hours (persons)</i>
Lethal exposure	0	0
Injury likely	0	6
Injury unlikely, but expense likely	1	15

<i>Evacuation Costs</i>		
<i>Number of People</i>	<i>Area</i>	<i>Cost</i>
67	1.8 sq. mi.	\$335,000

[4890]

Observations and Remarks

1. The above results would be the maximum possible for this type of accident in that all fission products would be involved and no shielding except the container is assumed.
2. Under the best conditions, namely, prompt evacuation of nearby personnel, no personal injury would be likely. The public loss would be due entirely to evacuation costs and payments for denial of use of land. This can be measured in the hundreds of thousands of dollars.
3. Under less favorable conditions, namely, slower evacuation, a small number of personal injuries might be expected.

4. Use of the typical site and population distribution is less satisfactory for this case since nearby population variations from site to site are larger than the numbers of people affected. The method does, however, give an order-of-magnitude.

5. For smaller site boundaries, larger numbers of people would be affected, especially in the injury category. However, with proper combinations of distance and shielding no loss to the public would be involved.

CASE II—THE VOLATILE RELEASE

Here it was assumed that, because of a breach in the container or failure to close all openings, all volatile fission products would be discharged to the atmosphere at the time of the accident. Four different situations of meteorological conditions and two particle size distributions were considered. Furthermore, separate indication is given for releases which include 1 percent of the strontium inventory and for those which do not.

A full summary of the calculated damages is contained in Appendix I. The following table contains a brief summary to indicate the magnitude and range of the consequences.

[4891]

The Volatile Release Case

Personal Injury

<i>A. Lethal exposure</i>	<i>Persons</i>	<i>Conditions at Release</i>
Minimum	2	Temperature lapse
Maximum	900	Temperature inversion, 1 μ particles

Assuming that (1) the particle size distributions are equally probable, and (2) the distribution of weather conditions is as stated in Appendix I, then lethal exposures would be less than five people for those accidents which might occur during about one-half of the time or less than 300 people for those accidents which might occur during about three-fourths of the time.

B. Injury Likely	Persons	Conditions at Release
Minimum	10	Temperature lapse 7 μ particles
Maximum	13,000	Temperature inversion, 1 μ particles

Using the same assumptions as under A, the number of persons injured would be less than 20 people for those accidents which might occur during about one-half of the time or 2000 people for those accidents which might occur during about three-fourths of the time.

Property Damage

II. Evacuation	Persons	Area (sq. mi.)	\$ Millions	Conditions
Minimum	0	—	—	Temperature lapse, dry
Maximum	41,000	28	205	Temperature inversion, rain

[4892]

Under the same assumptions as under A, the number of persons requiring evacuation would be less than 1000 people for accidents which might occur during about two-thirds of the time or 6000 people for those accidents which might occur during about nine-tenths of the time.

III.	General Restrictions (due to Sr)	Persons	Area (sq. mi.)	\$ Millions	Conditions
	Minimum	20	1	.01	Temperature lapse, dry, 1 μ
	Maximum	235,000	350	177	Temperature lapse, rain, 1 μ

Under the same assumptions as under A, the area placed under general restrictions would be less than 50 sq. mi. for those accidents which might occur during about three-fourths of the time.

IV.	Agricultural Restrictions (due to Sr)	Area (sq. mi.)	\$ Millions	Conditions
	Minimum	3	.1	Temperature lapse, dry, 1 μ
	Maximum	3,500	90.	Temperature lapse, rain, 1 μ

Under the same assumptions as under A, the area placed under agricultural restrictions would be less than 500 sq. mi. for those accidents which might occur during about nine-tenths of the time.

Observations and Remarks

1. The number of personal injuries is highly dependent upon existing weather conditions at the time of the accident. Few lethal exposures would occur during daytime conditions. Exposures of large numbers of persons would occur during temperature inversions, typical of nighttime conditions.

[5116]

Original Application for License by PRDC
POWER REACTOR DEVELOPMENT COMPANY

A NON-PROFIT CORPORATION

1100 DIME BUILDING

DETROIT 26, MICHIGAN

January 6, 1956

United States Atomic Energy Commission
Division of Licensing
Washington 25, D.C.

Attention: Harold Price, Director

Gentlemen:

We are submitting herewith our application for a class 104 license to build, own, and operate a developmental fast neutron breeder reactor which will produce the heat energy required to generate 100,000 kw electric power.

The construction of this reactor was proposed on behalf of a group of companies interested in reactor development as a part of the Commission's Power Demonstration Reactor Program in a letter dated March 30, 1955 and signed by myself as President of The Detroit Edison Company. It was stated in the proposal that in the event of the Commission's acceptance, a new company would be organized to carry out the project.

Since August 8, 1955 when the Commission approved the proposal as a basis for further negotiations, our Company has been incorporated under the laws of Michigan and steps are rapidly being taken to put it on an operating basis.

5117

This application is being submitted now so that we may undertake the detailed design of the reactor and begin field construction within the next few months. Early construction is necessary if we are to meet the proposed schedule. We would appreciate, therefore, the issuance of a construction permit at the earliest possible date.

We will, of course, be pleased to meet with you at any time to discuss any matters concerning this project, and to supply any additional information you may need for consideration of this application.

Yours very truly,

WALKER L. CISLER

WALKER L. CISLER

President

[5117]

POWER REACTOR DEVELOPMENT COMPANY . January 6, 1956

APPLICATION FOR LICENSE

UNDER

ATOMIC ENERGY ACT OF 1954

Submitted by

POWER REACTOR DEVELOPMENT COMPANY

1100 Dime Building

Detroit 26, Michigan

This application for the necessary license to design, construct, and operate a developmental fast neutron breeder reactor, to be located in Frenchtown Township, Monroe County, Michigan about 40 miles southwest of Detroit is submitted by Power Reactor Development Company (here-

inafter referred to as Applicant) pursuant to the Atomic Energy Act of 1954 and regulations thereunder.

The proposed reactor, to have an initial capacity of producing 100,000 kw electricity is to be built as a part of the Commission's "Power Demonstration Reactor Program" in accordance with the proposal submitted March 30, 1955 in a letter signed by Walker L. Cisler, President of The Detroit Edison Company (see Exhibit I).

The proposal was approved by the Commission as a basis of further negotiation on August 8, 1955 (see Exhibit II).

It is important to note that the atomic power plant with which this application is concerned will be built as two separate parts, (1) the breeder reactor and related facilities, including the fuel handling system, coolant systems, and steam generators (boilers) which will be designed, built, owned and operated by the applicant and (2) the conventional steam turbine generator and related facilities, including the transmission line which will be designed, built, owned and operated by The Detroit Edison Company (hereinafter referred to as Edison). Applicant will enter into a contract with Edison providing for the sale of steam produced by the reactor to Edison. Edison will utilize the steam so purchased in its turbine generator and will utilize the electric power produced in its own power system.

This application therefore relates only to the breeder reactor part of the plant but certain information concerning the facilities to be owned by Edison are included to show the completeness of the planning.

[5118]

Applicant

Power Reactor Development Company
1100 Dime Building
Detroit 26, Michigan

Applicant is a non-profit membership corporation organized in Michigan on August 30, 1955 (see Exhibit III for Articles of Incorporation, Exhibit IV for By-Laws).

The principal officers are:

Walker L. Cisler, President
The Detroit Edison Company
2000 Second Avenue
Detroit 26, Michigan

R. George Rincliffe,
Executive Vice President
Philadelphia Electric Company
1000 Chestnut Street
Philadelphia 7, Pennsylvania

Dan E. Karn, Vice President
Consumers Power Company
212 W. Michigan Avenue
Jackson, Michigan

Herbert S. Scholz, Vice President
Southern Services, Inc.
600 N. 18th Street
Birmingham 2, Alabama

Errol W. Doebler, Vice President
Long Island Lighting Company
250 Old Country Road
Mineola, Long Island, New York

5118

John A. Lagrou, Treasurer
17387 Monica Avenue
Detroit 21, Michigan

Leo I. Franklin, Secretary
1100 Dime Building
Detroit 26, Michigan

All of the above officers are United States citizens.

See Exhibit V for Board of Trustees. See Exhibit VI for Members of Power Reactor Development Company.

No alien, foreign corporation or foreign government has any control whatsoever over the applicant.

[5119]

License

Applicant requests a Class 104 license for a period of 25 years.

Technical Qualifications

Most of the member companies of Power Reactor Development Company have been engaged in atomic studies and development work from 2 to 10 or more years and qualified personnel from those companies will be available to assist in the management of the applicant's activities. In addition applicant will engage qualified organizations such as Atomic Power Development Associates, Inc. (hereinafter referred to as APDA), Nuclear Development Corporation of America and others to assist in the development, design, construction and operation of the proposed facility.

Purpose of the Facility

This developmental breeder reactor which will have the capacity to produce the heat required to generate 100,000 kw of electricity is to be constructed as a part of the Commission's "Power Demonstration Reactor Program" to obtain technical and economic information with respect to large power breeder reactors, and to gain experience and knowledge in the design, construction and operation of such reactors.

The reactor will be located on a site leased from The Detroit Edison Company, the term of the lease to be 25 years, concurrent with the term of the requested license. The facilities to be owned by Edison will be adjacent to the breeder reactor.

Financial Qualifications

Present estimates fix the cost of the proposed breeder reactor and related facilities to be owned by applicant as \$40,511,000. This includes liberal allowances for all construction costs, for preoperation testing, and working capital to permit the applicant to engage in the business activities incident to the operation of the reactor.

This estimate does not include:

1. Research and development work completed by APDA which has cost nearly \$10,000,000 prior to January 1, 1956.
2. Certain additional research and development work to be done by APDA which is included in the APDA budget for 1956 and 1957.

[5120]

3. The cost of certain research and development work and other assistance to be provided by the Commission under terms of the Power Demonstration Reactor Program.

4. The value of the inventory of special nuclear materials required for the operation of the reactor (see Exhibit VII for statement of materials required).

The reactor will be financed as follows:

Payments by member companies	\$25,511,000
Loans from banks—guaranteed by member companies	15,000,000
Total	\$40,511,000

The proposed member companies have informally agreed to make payments to applicant in excess of the above mentioned \$25,511,000. Steps are now being taken to formalize these agreements.

Banks have informally agreed to loan the applicant \$15,000,000 for a period of 10 years, subject to guarantees by the member companies. The bank loan agreement is now being negotiated.

It should be noted that the 26 companies that propose to become members of applicant are all substantial business organizations with large resources. It can be assumed that they easily have the capacity to see that a project of the importance of this one is carried out.

Completion Date

Zero and low power reactor operation is now scheduled to start during the summer of 1959. Full power operation is planned approximately one year later.

Since these dates depend upon much research and development work, it is possible that the above dates may be delayed up to one year.

Jurisdiction of Public Service Regulatory Agencies

Applicant will not be engaged in the generation of electric power, and will not sell energy to the public. It is anticipated therefore that applicant will not be subject to the jurisdiction of any public service regulatory agency.

[5121]

Contract between Commission and Applicant

Negotiation of a contract between the Commission and applicant which will define the services to be provided by the Commission under the Power Demonstration Reactor Program are in progress; John J. Flaherty, Manager of the Chicago Operations office acting for the Commission. The most recent draft of the proposed contract and its Appendix A is included with this application as Exhibit VIII.

TECHNICAL INFORMATION

The conceptual design and development of this proposed reactor is the work of APDA. This design is described in considerable detail in APDA Report No. 108, "Description of Developmental Fast Breeder Power Reactor Plant", which is included with this application as Exhibit X.

Nuclear Process to be performed

The fast breeder reactor depends upon a self-propagating chain reaction of nuclear fissions caused by neutrons re-

leased during the fission process. In this type reactor, the fission process is maintained by high energy (fast) neutrons, and more nuclear fuel is produced than is consumed. The neutrons remain at high energy, as there is no moderator. Essentially, the reactor is composed of fuel and coolant.

Liquid sodium is to be used as the primary coolant and consequently an inert gas seal system and an impurity cold trap arrangement will be provided. A description of the inert gas system and the venting system is given in the Liquid Metal and Steam Section of APDA-108 (pages 68-87).

This reactor is designed to operate on uranium-235 fuel and will produce about 300,000 kilowatts of heat with a corresponding gross electrical output of 100,000 kilowatts. Approximately 450 kilograms of uranium-235 are required for the core. The uranium-235 consumption per year is 91.7 kilograms and with a 1.2 breeding ratio, 109 kilograms plutonium will be produced per year. According to present plans reprocessing of the irradiated fuel subassemblies and the blanket subassemblies will be done by the Commission off the site, and consequently the waste disposal considerations involved in such an operation are not pertinent to this application.

Description of Facility

As detailed description of the fast breeder power plant is given in APDA-108 (see Exhibit X). Specific characteristics essential to the safe operation of the facility include:

[5122]

1. A reactor designed to be stable and safe under all conceivable operating conditions.

2. An airtight, steel, cylindrical reactor building which encloses the reactor, the fuel handling mechanisms, and the primary coolant system. This building is designed to contain the products of any conceivable reactor incident that results in release of fission products and radioactive sodium.

3. An intermediate or secondary non-radioactive coolant system which transfers heat from the primary coolant system to the water and steam system. This intermediate system is provided to avoid the release of radioactivity in the event of a NaK-water reaction.

4. An integral low-pressure primary liquid metal coolant system with equipment arranged in sumps so that removal may be accomplished without draining the system.

Safety

It has been apparent to the reactor designers since the beginning that the safety of the reactor is of paramount importance and that when there is a choice of several design alternatives, that alternative which provides the greatest inherent safety must always be accepted.

There are three general requirements of reactor safety. The first and most important is that the public be protected from any release of radioactive material which would have any adverse effects. The second is that the operators must be protected from all harmful conditions. The third is that the investment in the reactor power plant must be protected against loss due to irreparable damage to the reactor.

The design of the reactor and its auxiliary equipment has been directed so that the possibility of the reactor becoming prompt critical due to operating error is prevented. In addition, all design features have been examined carefully in order to detect any autocatalytic effects which could cause damage to the reactor. It is believed that there are no features in the present design which represent inherently dangerous mechanisms.

Adequate neutron and gamma ray shielding is provided around the reactor and primary coolant system so that radiation levels are well below tolerance to personnel. Equipment is placed in shielded compartments where this requirement is necessary.

[5123]

Although it is felt that careful design of the reactor and its equipment have made the possibility of accident extremely unlikely, it has been deemed prudent to incorporate two protective barriers between the reactor and the public. The first barrier will be a gas-tight steel building which would contain the radioactive materials released in the improbable event of a more serious accident to the reactor than any now foreseeable. The second barrier is the exclusion area afforded by the site.

During 1955, the APDA representatives met twice with a subcommittee of the Advisory Committee on Reactor Safeguards and made one informal presentation to the entire committee. The APDA Report 108 (see Exhibit X), was prepared for the information of this committee. Suggestions and comments gathered at these conferences have been evaluated and, in many cases, worked into the design.

It is the policy and intent of the applicant to design, build, and operate the reactor power plant in a manner consistent with the financial and moral obligations incumbent upon the builders and operators of a facility of this nature.

Site

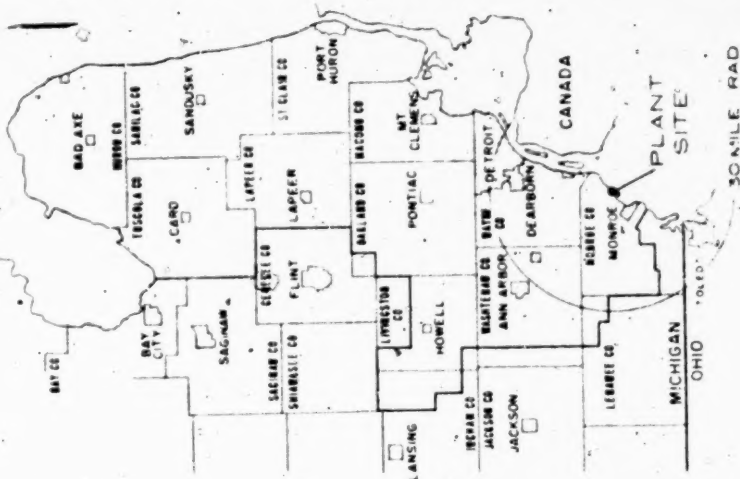
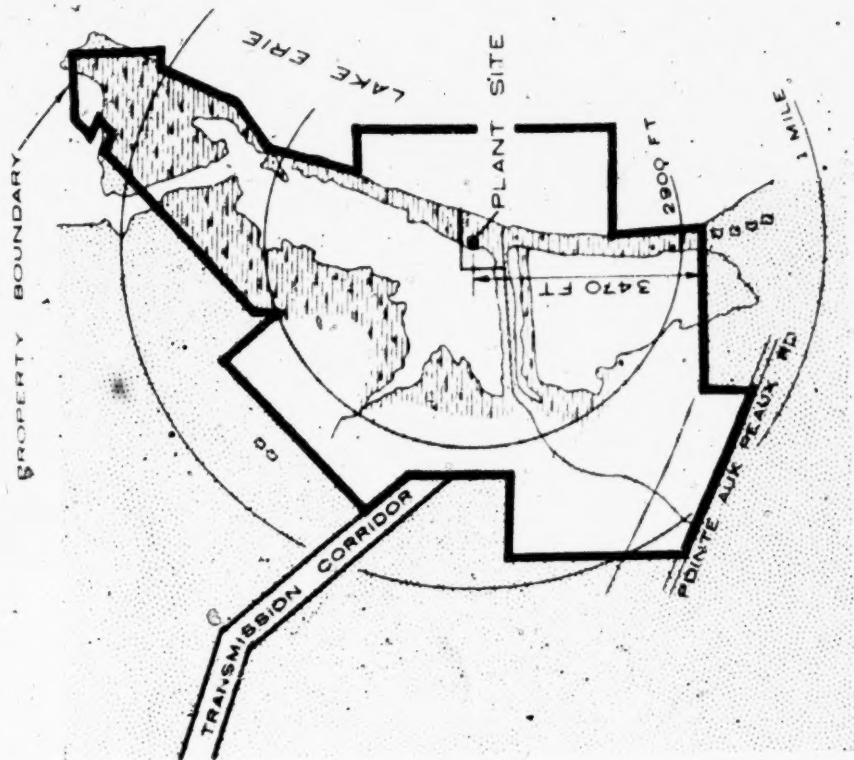
The reactor and associated electric generating plant will be built on approximately 900 acres of land owned by Edison, and located about 30 miles southwest of the City of Detroit. This site is on the western shore of Lake Erie at Lagoona Beach, Frenchtown Township, Monroe County, Michigan. The property is generally low and marshy and lies in a farming territory about $7\frac{1}{2}$ miles north of the City of Monroe, whose population is approximately 20,000. There are about 32,000 inhabitants within a 10 mile radius of the reactor, but less than 2,000 year-round inhabitants within a 5 mile radius. Four summer-resort communities lie within this 5 mile zone and an increase in population is experienced during the summer months. At present no industrial plants are located within this 5 mile zone.

The general location of the property with respect to the Edison service area, and an outline of the property showing the proposed location of the plant is shown by Figure 1 on the following page. Figure 2 shows a layout of the facilities on the site.

The area owned by Edison as shown by Figure 1 provides a minimum exclusion radius of 2,900 feet and there are no residences or inhabitants within 3,500 feet of the reactor site.

[5124]

- 8 -



LOCATION OF LAGOONA, BEACH PROPERTY

Fig 1

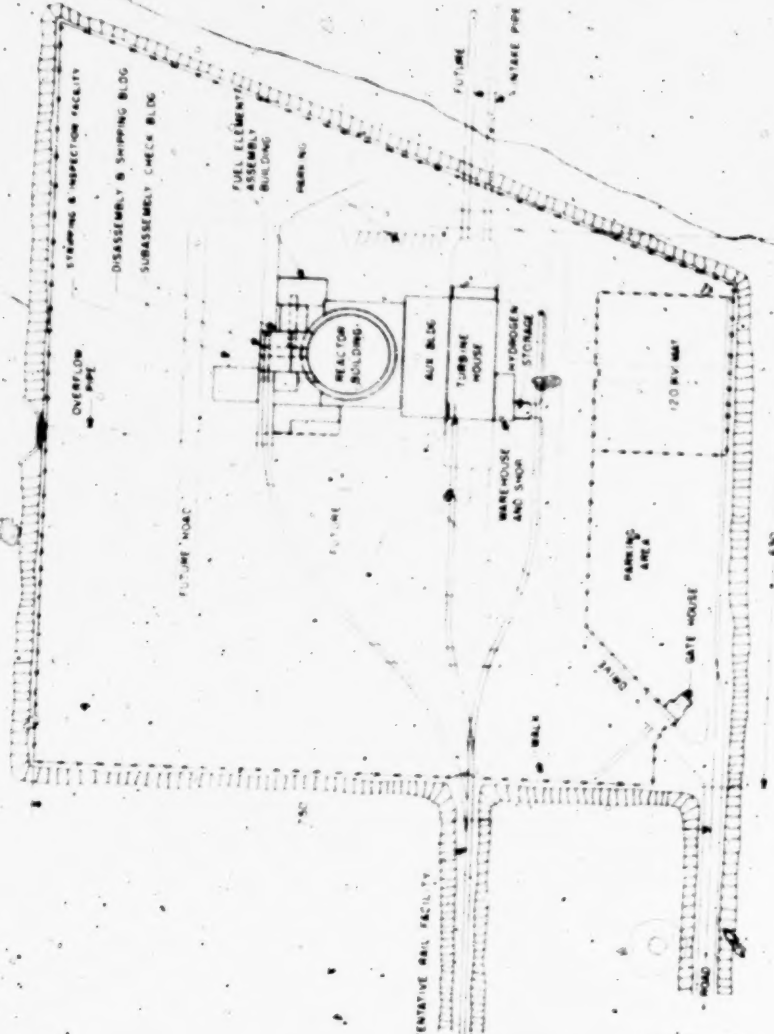
[5125]

5125'

- 9 -

N

LAKE
ERIE



PROPOSED PLANT LAYOUT

[5126]

POWER REACTOR DEVELOPMENT COMPANY -10- January 6, 1956

The following maps provide additional detail on the site:

Exhibit IX A—Map of the area showing the location of the property with respect to towns and cities in Lower Michigan.

Exhibit IX B—Aerial view of the site showing the populated areas to the south, including Monroe.

Exhibit IX C—A topographical map of the site showing the populated areas to the south.

The site described in APDA-108 (pages 92 and 93) is the Lagoona Beach site. Preliminary data on air pollution, climatology, geology and physiography, and seismology for this area are present in APDA-108 (pages 92-104).

Information to be submitted Later

Some of the information requested in sections 50.34 (d), (e), (f), and (g) of 10 C.F.R. 50, is included in APDA-108 (see Exhibit X). Additional time is required before complete technical information can be supplied.

The information for (f) should be available within a year. The remaining information must await completion of the detailed design.

Summary of Applicants Requests

The applicant respectfully requests the following:

1. That the Commission grant applicant a single Class 104 license for a period of 25 years authorizing the following activities:

- (a) The design, construction, ownership and operation of the reactor heretofore described, as both a production and utilization facility; and
- (b) The possession and use of special nuclear material in the amounts required to construct and operate the proposed reactor,

2. That the Commission issue to applicant a construction permit for the reactor heretofore described.

3. That the Commission agree to make available to applicant special nuclear material in the amounts required to operate the reactor for the period of the license, as set forth in Exhibit VII.

[5127]

POWER REACTOR DEVELOPMENT COMPANY -14- January 6, 1956

4. That the Commission agree for the period of the license to furnish the transportation (1) for the special nuclear material to the location where such material will be fabricated for use in the reactor and (2) for the irradiated fuel and blanket elements from the reactor site to the Commission facilities for recovery and decontamination of the special nuclear material contained in such elements.

IN WITNESS WHEREOF; POWER REACTOR DEVELOPMENT COMPANY has caused its name to be hereunto signed by Walker L. Cisler, its President, and its corporate seal to be hereto affixed by Leo I. Franklin, its Secretary, thereunto duly authorized, this 6th day of January 1956.

POWER REACTOR DEVELOPMENT
COMPANY

By WALKER L. CISLER
President

Attest:

LEO J. FRANKL
Secretary.

[5129]

Exhibit I

THE DETROIT EDISON COMPANY

2000 SECOND AVENUE
Detroit 26, Michigan

March 30, 1955

WALKER L. CISLER
President

United States Atomic Energy Commission
1901 Constitution Avenue
Washington 25, D. C.

Gentlemen:

In furtherance of our letter of July 12, 1954, this proposal to design, construct, own and operate a fast neutron breeder reactor is submitted for your consideration in response to your January 10, 1955 announcement of a "Power Demonstration Reactor Program." It is submitted on behalf of the Central Hudson Gas and Electric Corporation, The Cincinnati Gas & Electric Company, Consumers Power Company, Delaware Power & Light Company, The Detroit Edison Company, Long Island Lighting Company, Philadelphia Electric Company, Rochester Gas and Electric

Corporation, The Toledo Edison Company, and others who have or may hereafter signify their intention to join the project. All but one of those named have been engaged in an intense effort to develop a breeder reactor that can be capable of producing steam for generation of electric energy on a commercially competitive basis.

The proposed reactor is described in some detail in the classified (Confidential) document entitled "Description of Proposed Developmental Fast Neutron Breeder Reactor," dated March 25, 1955, which is submitted as an appendix hereto. A photograph of a model of the reactor-electric plant is attached to this letter. The design adopted is chiefly the result of the work of engineers and scientists assembled for the Atomic Power Development Associates study and research project. They reviewed information available from various sources, including your Commission Laboratories and personnel, and especially Argonne National Laboratory. They also sought out new information, and developed many new ideas which have been incorporated in the design. The results also reflect the views of private contractors and investigators, consultants, and others engaged in engineering and scientific activities.

The reactor will be liquid sodium cooled, will utilize

[5130]

enriched uranium as fuel, and will be designed to produce heat sufficient for the generation of 100,000 kilowatts of electric power. Fuel elements will be made up of assemblies of clad uranium alloy pins. Blanket elements will be assemblies of depleted uranium rods.

We are prepared to meet with you at such time as you may wish, looking toward reaching a mutually agreeable understanding with respect to the following:

- (a) A license to locate, construct, own and operate a reactor, to demonstrate its practical value, and
- (b) A license to possess special nuclear material, and
- (c) A sufficient supply of fuel and blanket materials, and
- (d) The processing or irradiated fuel and blanket elements, and
- (e) The payment by the Commission for special nuclear material produced by the proposed reactor, and
- (f) The performance of certain research and development work in Commission facilities, and
- (g) The matter of technical and economic data resulting from the reactor development.

If the foregoing and certain other problems can be satisfactorily resolved, we shall undertake to organize a non-profit corporation (a) to design, finance and construct a fast neutron breeder reactor; (b) to own and operate the reactor; and (c) to apply for and hold licenses from the Commission for such construction, ownership and operation and the possession and use of special nuclear and source materials. This corporation would be dedicated to research and development in the use of nuclear fuels, and results would be made available to you and to others as directed by you.

[5131]

It is our judgment that the successful completion of this fast breeder reactor plant is now a matter of straight-

forward engineering development, design and construction and that detail design of the reactor is possible within the limits of the proposed construction schedule. Furthermore, the continuing study of the design may result in certain advantageous improvements.

The control and safety aspects of the reactor have been analyzed at length. These analyses demonstrate clearly in our opinion, that the reactor will be controllable and safe beyond any credible doubt. Moreover, it will be housed in a gas-tight cylindrical steel structure designed to contain the products of a possible reactor accident.

Our present plans call for the location of the reactor in the service area of The Detroit Edison Company on a 1,200 acre site approximately $3\frac{1}{2}$ miles southeast of the business district of Monroe, Michigan (see Map, Fig. 1 page 9 of appendix). Practically all of the ground area within a radius of one mile would be included in the plant site area owned by the Company. There are few residences within a two mile radius. We are also considering other sites within the service area of The Detroit Edison Company.

We believe that the reactor can be constructed and capable of producing steam for generation of electric power within approximately $4\frac{1}{2}$ years after your acceptance of this proposal. This time would include a period of more than one year of preliminary operation during which significant amounts of steam might be produced.

In order to meet the time schedule desired, research and development work of the following nature, which can best be done in your Commission facilities, as offered in the

Commission announcement of January 10, 1955, would be needed:

1. Critical experiment.
2. Safety test.
3. Radiation damage tests.
4. Fuel reprocessing development.

The extent to which your Commission may desire to participate in other research is a subject we will be pleased to discuss. We would expect to work closely with Argonne which has been most helpful.

We estimate that the total cost of the reactor, exclusive

[5132]

of electric generating facilities, would range up to \$5,000,000, distributed approximately as follows:

Plant Site and Improvements	\$ 1,700,000
Research and Development Work	9,000,000
Engineering, Design and Construction of Reactor Plant	29,100,000
Preliminary Operation, Working Capital, Business and Miscellaneous Expense Prior to Firm Operation	5,200,000
Total Cost of Reactor	\$45,000,000

Coincident with the construction of the reactor, The Detroit Edison Company, at its own cost, estimated as \$9,000,000, will proceed with the construction of electric generating facilities having a capacity of not less than 100,000 kilowatts. Thus, the total cost of the entire project would be approximately \$54,000,000.

We now have reasonable assurance that more than two thirds of the total estimated cost of the entire project will be available when the proposed licensee is organized and its finance plans made final. We believe it will be possible to have the balance provided by agreements of others, some of which have signified their intention to participate in this project. Of necessity the complete financing is therefore, dependent upon the joinder of others.

It would be important to us that the licensee corporation be reasonably sure of its ability to obtain adequate insurance. We understand that the Commission has joined with representatives of the insurance industry in a study of this important matter.

In making this proposal we assume and regard as essential the following: (1) that neither the licensee corporation, nor any member thereof or contributor thereof will become subject to the Public Utility Holding Company Act by reason of participation in this project, and (2) that the contributions of the members to the licensee corporation will qualify as deductible for Federal Income Tax purposes.

We would, of course, expect that the construction, ownership and operation of the reactor will be subject to complete

[5133]

regulation by the Atomic Energy Commission.

We will be most pleased to discuss this proposal with you at any time that may suit your convenience. Our de-

is to go forward with this project as rapidly as possible when we have reached agreement with you.

Very truly yours,

THE DETROIT EDISON COMPANY

By WALKER L. CISLER

President

Encls.

[5137]

Exhibit III

(Non-Profit)

ARTICLES OF INCORPORATION of

POWER REACTOR DEVELOPMENT COMPANY

A Non-Profit Organization

Organized Under the Laws of the State of Michigan

These Articles of Incorporation are signed and acknowledged by the incorporators for the purpose of forming a non-profit corporation under the provisions of Act. No. 327 of the Public Acts of 1931, as amended, as follows:

ARTICLE I.

The name of the corporation is POWER REACTOR DEVELOPMENT COMPANY.

ARTICLE II.

The purpose or purposes for which the corporation is formed are as follows:

To be a business league of members of industries in the United States interested in the conservation of natural resources and the economical production of electric energy, and to study, develop, design, fabricate, construct and operate one or more experimental nuclear power reactors and any or all component parts, to the end that there

[5138]

may be an early demonstration of the practical and economical use of nuclear energy for the generation of electric energy, together with such industrial and scientific products and by-products and applications as may seem desirable; and in furtherance thereof to engage in any and all of the following:

(a) To design, develop, fabricate and construct, and operate a test or developmental nuclear power reactor or reactors, or to cause that to be done, and to demonstrate that such reactor or reactors may be relied upon to provide an economical source of heat or other power to be used in the generation of electric energy, and also for other industrial, scientific, and commercial purposes, and

(b) To collect or otherwise acquire information relating to the purposes of the Company and to communicate such information to the United States Atomic Energy Commission for the use of the public, and to disseminate such information to its members and to all others who may reasonably request such information for their proper business purposes, to the extent permitted by law, and

(c) To enter into such contracts and arrangements with, and to secure such licenses from, the United States of America or its Atomic Energy Commission or any other agency or department thereof, as may be appropriate or required by law to carry out the purposes of the Company, and to contract with other persons or organizations, private or public, for them to engage in experiments, research, fabrication and construction, and any other work to advance the purposes of the Company, and

(d) To receive membership fees, dues, contributions and payments in cash or services from members or others interested

[5139].

in the accomplishment of the purposes of the Company.

ARTICLE III.

Location of the first registered office is:

1100 Dime Building, Detroit 26; Wayne County, Michigan.

Postoffice address of the first registered office is:

1100 Dime Building, Detroit 26, Michigan.

ARTICLE IV.

The name of the first resident agent is:

Walker L. Cisler.

ARTICLE V.

Said corporation is organized upon a non-stock basis.

The amount of assets which said corporation possess is:

Real Property: None

Personal Property: \$10,000.00 in Cash

Said corporation is to be financed under the following general plan: By dues, membership fees, contributions, grants, proceeds of activities, and contracts

[5140]

entered into pursuant to the purposes of the Company.

ARTICLE VI.

The names and places of residence, or business of each of the incorporators are as follows:

(At least three required)

Names	Residence or Business Address
Prentiss M. Brown	St. Ignace, Michigan
Walker L. Cisler	2000 Second Avenue Detroit 26, Michigan
John S. Coleman	6071 Second Boulevard Detroit 2, Michigan
George M. Holley, Jr.	11955 Nine Mile Road Van Dyke, Michigan
Justin R. Whiting	212 Michigan Ave. N.W. Jackson, Michigan

ARTICLE VII.

The names and addresses of the members of the first Board of Trustees are as follows:

(At least three required)

Names	Address
Prentiss M. Brown	St. Ignace, Michigan
Walker L. Cisler	2000 Second Avenue
	Detroit 26, Michigan
John S. Coleman	6071 Second Boulevard
	Detroit 2, Michigan
George M. Holley, Jr.	11955 Nine Mile Road
	Van Dyke, Michigan
Justin R. Whiting	212 Michigan Ave. N.W.
	Jackson, Michigan

[5141].

ARTICLE VIII.

The term of the corporate existence is 30 years.

ARTICLE IX.

The Company is not to be operated for profit, and no part of the net earnings of the Company shall inure to the benefit of any member or any private individual or corporation; and no part of the activities of the Company shall consist in carrying on propaganda or otherwise attempting to participate in any political campaign or to influence legislation.

ARTICLE X.

If for any reason it is determined that this Company shall be dissolved, or if it shall otherwise cease to exist, any property remaining in its hands after the discharge of all of its obligations shall be distributed to such corporation or corporations organized and operated exclusively for educational or scientific purposes and not for profit as

the Board of Trustees may determine, to be used by such corporation or corporations solely for educational and scientific purposes to further research and development in the use of atomic energy for peaceful purposes.

[5142]

It is the intention of the incorporators that all funds and property of this Company shall be devoted to the purposes hereof and shall not revert to those furnishing it with funds; accordingly, at no time shall any property of the Company be returned to the original incorporators or other members, or to any donors or contributors.

We, the incorporators, sign our names this 24th day of August, 1955.

WALKER L. CISLER (sgd)

WALKER L. CISLER

JOHN S. COLEMAN (sgd)

JOHN S. COLEMAN

GEORGE M. HOLLEY, JR. (sgd)

GEORGE M. HOLLEY, JR.

JUSTIN R. WHITING (sgd)

JUSTIN R. WHITING

PRENTISS M. BROWN (sgd)

PRENTISS M. BROWN

State of Michigan }
County of Wayne } ss.:

On this 24th day of August, 1955, before me personally appeared Walker L. Cisler, to me known to be one of the persons described in and who executed the foregoing instru-

ment, and acknowledged that he executed the same as his free act and deed.

GERALD C. SIMON (sgd)
Notary Public, Wayne County, Michigan
 My commission expires July 26, 1959

[5143]

State of Michigan)
 County of Wayne { ss.:

On this 29th day of August, 1955, before me personally appeared John S. Coleman, to me known to be one of the persons described in and who executed the foregoing instrument, and acknowledged that he executed the same as his free act and deed.

GERALD C. SIMON (sgd)
Notary Public, Wayne County, Michigan
 My commission expires July 26, 1959

State of Michigan)
 County of Wayne { ss.:

On this 29th day of August, 1955, before me personally appeared George M. Holley, Jr., to me known to be one of the persons described in and who executed the foregoing instrument, and acknowledged that he executed the same as his free act and deed.

GERALD C. SIMON (sgd)
Notary Public, Wayne County, Michigan
 My commission expires July 26, 1959

[5144]

State of Michigan }
 County of Wayne } ss.:

On this 29th day of August, 1955, before me personally appeared Justin R. Whiting, to me known to be one of the persons described in and who executed the foregoing instrument, and acknowledged that he executed the same as his free act and deed.

GERALD C. SIMON (sgd)

Notary Public, Wayne County, Michigan

My commission expires July 26, 1959

State of Michigan }
 County of Wayne } ss.:

On this 29th day of August, 1955, before me personally appeared Prentiss M. Brown, to me known to be one of the persons described in and who executed the foregoing instrument, and acknowledged that he executed the same as his free act and deed.

GERALD C. SIMON (sgd)

Notary Public, Wayne County, Michigan

My commission expires July 26, 1959

Filed with Michigan Corporation
 and Securities Commission
 August 30, 1955

[5410]

December 10, 1956

United States Atomic Energy Commission
Division of Licensing
Washington 25, D. C.

Gentlemen:

On January 7, 1956, we filed our application for a license under Section 104(b) of the Atomic Energy Act of 1954 to construct and operate a nuclear reactor. Amendments to this application were filed by us on June 6, 1956, July 12, 1956, July 20, 1956 and July 23, 1956. On August 4, 1956, the Commission issued a provisional construction permit authorizing construction of the reactor, subject to certain conditions. These conditions included a requirement of later submission of additional information relating to our Company's financial resources and of a complete, final Hazards Summary Report.

Thereafter, various persons intervened in this matter and on October 8, 1956, the Commission ordered that a hearing be held on a designated Specification of Issues, including the issue whether the Commission should grant any exemptions pursuant to Section 50.12 of its regulations. The hearing is now scheduled for January 8, 1957.

While we believe that our original application, as amended, is broad enough to constitute an application for temporary exemptions under Section 50.12 from certain of the Commission's regulations, subsequent developments indicate the desirability of confirming and clarifying the application by an additional amendment designating explicitly the exemptions which are requested. We have therefore includ-

5410

ed in the attached Amendment No. 5 to our Application License, which is herewith submitted for filing, request for specific exemptions from certain of the requirements of Sections 50, 35, 50.40(b) and 50.60(c)(2) of the Commission's regulations.

Very truly yours,

ROBERT W. HARTWELL
Assistant General Manager

RWH:eml
Enclosure:

[5411]

AMENDMENT NO. 5 TO APPLICATION FOR LICENSE
UNDER
ATOMIC ENERGY ACT OF 1954
SUBMITTED BY
POWER REACTOR DEVELOPMENT COMPANY

Power Reactor Development Company submits the following amendment to the Application for a Section 104 (1) License submitted by it under date of January 6, 1956.

Amend the Application by inserting on Page 10 there immediately preceding the caption "Summary of Applicant's Requests" the following additional paragraph:

"Request for Exemptions under 10 C. F. R. 50.12

- "(1) Applicant applies for exemption from the requirement of 10 C. F. R. 50.35 that the Commission be satisfied in connection with the issuance of a construction permit on a provisional basis

that it has information sufficient to provide reasonable assurance that a facility of the general type proposed can be * * * *operated* at the proposed location without undue risk to the health and safety of the public * * *. Applicant does not request exemption from the requirements of this Section 50.35 that the Commission be so satisfied that it has information sufficient to provide reasonable assurance that a facility of the general type proposed can be *constructed* at the proposed location without undue risk to the health and safety of the public, and that the Commission be satisfied that technical information omitted from the application will be supplied.

- "2) Applicant applies for exemption from the requirements of 10 C. F. R. 50.40(b), relating to financial qualification to engage in the proposed activities, in such respects, if any, as the Commission determines to be appropriate in connection with the issuance of a construction permit on a provisional basis.

[5412]

- "3) Applicant applies for exemption from the requirement of 10 C. F. R. 50.60(c)(2), relating to financial qualification to pay for and use special nuclear material, in such respects, if any, as the Commission determines to be appropriate in connection with the issuance of a construction permit on a provisional basis."

IN WITNESS WHEREOF, POWER REACTOR DEVELOPMENT COMPANY has caused its name to be here-

5412

unto signed by John A. Lagrou, its Treasurer, and its corporate seal to be hereto affixed by John F. Anderson, its Assistant Secretary, thereunto duly authorized, this 10th day of December, 1956.

**POWER REACTOR
DEVELOPMENT COMPANY**

By **JOHN A. LAGROU**
Treasurer

ATTEST:

JOHN F. ANDERSON
Assistant Secretary

(Corporate Seal)

Attest:

[5435]

Application Exhibit XXI

**AGREEMENT
BETWEEN
POWER REACTOR DEVELOPMENT, COMPANY
AND
ATOMIC POWER DEVELOPMENT
ASSOCIATES, INC.**

THIS AGREEMENT entered into this 14th day of December, 1956, between POWER DEVELOPMENT COMPANY, a non-profit membership corporation organized and existing under the laws of the State of Michigan (herein called "PRDC"), and ATOMIC POWER DEVELOPMENT ASSOCIATES, INC., a non-profit membership corporation organized and existing under the laws of the State of New York (herein called "APDA");

WITNESSETH:

WHEREAS, APDA is conducting, and intends to continue to conduct, a research and development program relative to the utilization for power purposes of atomic reactors, especially of the type known as a fast neutron breeder reactor;

WHEREAS, the purpose of PRDC is to construct and operate a developmental sodium cooled fast neutron breeder reactor and requisite appurtenant facilities (hereinafter called the "Reactor Plant"), and to thereafter operate the Reactor Plant to study, establish and demonstrate its technology and practical value;

WHEREAS, APDA has developed a conceptual design of a reactor plant and, accordingly, is interested in the demonstration of the application of such design; and

WHEREAS, the program of PRDC will provide for purposes of study by APDA and others a reactor plant in the nature of a laboratory for the demonstration of the science and technology of a fast neutron breeder reactor, such plant to be constructed in response to the Power Demonstration Reactor Program of the Atomic Energy Commission (herein called "AEC").

NOW, THEREFORE, in consideration of the premises and of the mutual undertakings hereinafter set forth, the parties agree as follows:

ARTICLE I—REACTOR DESIGN SERVICES

A. APDA will furnish to PRDC without charge a complete design for those components of the Reactor Plant within and including the secondary containment vessel and for the primary coolant loops,

[5436]

which collectively are herein referred to as the "reactor proper" as identified on Exhibits A and B of this agreement.

B. In connection with and as incident to the furnishing of a design for the reactor proper, APDA agrees to transfer to PRDC certain equipment and devices (consisting principally of a reactor vessel, a rotating shield plug, handling and control devices and a primary coolant system) which APDA expects to assemble and to test for suitability of design, mechanical performance, hydraulic characteristics, thermal stress information and similar data. Such equipment and devices will be transferred after tests have been completed by APDA and at a time to be agreed upon between the parties, upon written request by PRDC at some time after receipt by PRDC of a construction permit under the Atomic Energy Act of 1954 (herein called "the Act"). Such equipment and devices will be transferred on a "where-is, as-is" basis and APDA will be compensated therefor on the basis of the salvage value of such equipment and devices as determined by agreement of the parties. APDA makes no warranty, express or implied, as to the completion of such equipment and devices, their condition or suitability for incorporation in the Reactor Plant.

C. APDA will also furnish to PRDC copies of designs, drawings and documents relating to the aforesaid equipment and devices, tests performed thereon and modifications in such equipment and devices made in the course of testing.

D. APDA agrees to furnish necessary engineering information to enable PRDC to purchase the additional equip-

ment needed to adapt the aforesaid equipment and devices to the Reactor Plant to the extent such aforesaid equipment and devices are part of the reactor proper. APDA also agrees to furnish specifications for modification of the aforesaid equipment and devices necessary to adapt them to the Reactor Plant.

E. APDA agrees to furnish (a) detailed specifications for the fuel and blanket subassemblies of the Reactor Plant; and (b) reactor physic and control studies performed by or for APDA pertaining to a fast neutron breeder reactor.

ARTICLE II—TECHNICAL AND CONSULTING SERVICES

A. In addition to the work called for in Article I hereof APDA agrees to provide technical services, including preliminary designs and necessary studies incident thereto, in connection with the following components of the Reactor Plant:

1. Shielding
2. Fuel element transfer and decay equipment
3. Gas systems, including the shield cooling system, gas seal systems and building ventilation system

[5437]

4. Foundations for reactor building
5. Reactor Building
6. Control room
7. Secondary coolant system (including heat exchangers and boilers)
8. Plant instrumentation (including control panels)

9. Pre-shipment processing facility

10. Other reactor components

B. APDA also agrees to provide consulting services to PRDC including, but not limited to, the following:

1. Review of preliminary drawings prepared by other contractors for PRDC on the basis of preliminary designs prepared by APDA.
2. Review of final designs to the extent necessary to make recommendations on the functional operation of equipment covered by such designs.
3. Liaison with the contractors of AEC in connection with research and development work done by the AEC or its contractors for PRDC.
4. Advise on other research and development work done by or for PRDC.
5. Assistance in preparation of material relating to hazards and safety of the Reactor Plant.
6. An outline of the general scope of the procedure for the operation of the Reactor Plant.

ARTICLE III.—LIMITATIONS ON APDA OBLIGATIONS AND LIABILITY

A. The obligations of APDA hereunder are subject to availability of funds under its established budget procedures, except as the parties may otherwise agree.

B. In the performance of the services contemplated in Articles IA, IC and II hereof, APDA shall be held to the standard of care customary in the performance of such services.

C. PRDC hereby indemnifies and holds harmless APDA from any claim or cause of action (1) arising after the

transfer of the equipment and devices referred to in Article IB and asserted against

[5438]

APDA by reason of the nature, manufacture, assembly or performance of such equipment and devices; and (2) asserted against APDA by third persons by reason of the design, construction or operation of the Reactor Plant.

ARTICLE IV—INSURANCE

PRDC shall carry, at its expense, bodily injury and property damage liability insurance (covering APDA, as its interest may appear) which may be made available in connection with the operation of the Reactor Plant and enter into an indemnification agreement with AEC, if and to the extent Government indemnification is available, to implement the indemnification obligations of PRDC under Article III hereof.

ARTICLE V—ASSIGNMENT OF PERSONNEL

Scientific and technical personnel of PRDC or PRDC member companies may be assigned to APDA for training and assistance and to work on the APDA program. Each proposal to make such an assignment shall be separately submitted and APDA may in the reasonable exercise of its discretion accept or reject the individual proposed to be assigned. APDA will enter into separate agreements covering each individual so assigned with each such individual's employing company. Employees assigned hereunder shall be under the exclusive technical and administrative control of APDA throughout the period of assignment.

ARTICLE VI—EXCHANGE OF INFORMATION

APDA and PRDC will provide each other all such technical, scientific, operational, economic or other information which may be developed by themselves or their various contractors which is pertinent to the respective programs of either party. PRDC may make all such information available to AEC, as required by AEC. APDA and PRDC agree to keep and cause their contractors to keep records of all such information.

ARTICLE VII—PATENTS

A. The parties mutually recognize that the provisions of their respective by-laws contemplate the free dissemination of information gained by the parties hereto in their respective programs and further recognize that any patents acquired by either of the parties in the course of their programs are freely available to each other, to their respective member companies and to the public, subject only to the authority of the AEC.

B. No claim for pecuniary award or compensation under the provisions of the Act shall be made by APDA or PRDC, their employees, agents or others with respect to any invention or discovery made or conceived in the course of any of the work under this agreement.

[5439]

C. Both ADPA and PRDC will execute all documents and instruments and do all things, including obtaining such agreements from their respective employees, contractors, member companies and agents as may be necessary or proper to effectuate the purposes hereinabove set forth.

ARTICLE VIII—ASSIGNMENT

This agreement shall not be assigned by either party hereto without the written consent of the other party.

ARTICLE IX—GENERAL RESTRICTION

All the agreements and covenants hereunder are subject to the provisions of the Act.

IN WITNESS WHEREOF, the parties hereto have caused these presents to be executed, and their respective seals to be affixed, by their officers thereunto duly authorized, on the day and year first above written.

POWER REACTOR
DEVELOPMENT COMPANY

By R. G. RINCLIFFE,
Executive Vice President

ATTEST:

GEORGE E. OLMSTED

Secretary

*Power Reactor Development
Company*

ATOMIC POWER DEVELOPMENT
ASSOCIATES, INC.

By J. F. FAIRMAN
Vice President

ATTEST:

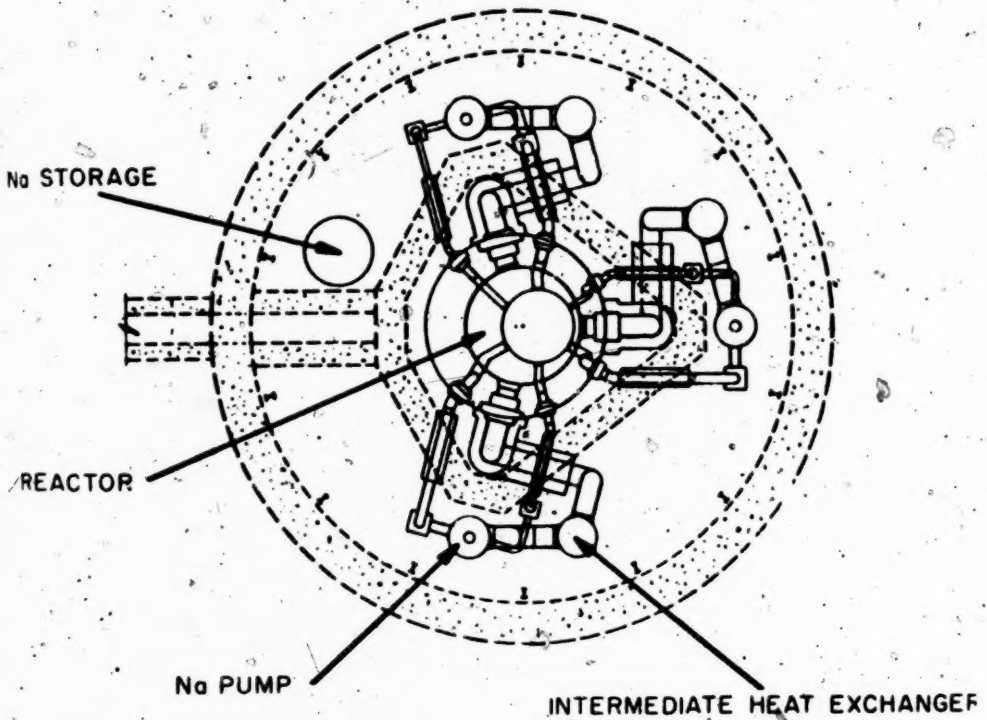
ALVIN E. UPTON

Secretary

*Atomic Power Development
Associates, Inc.*

[5440]

FIGURE A

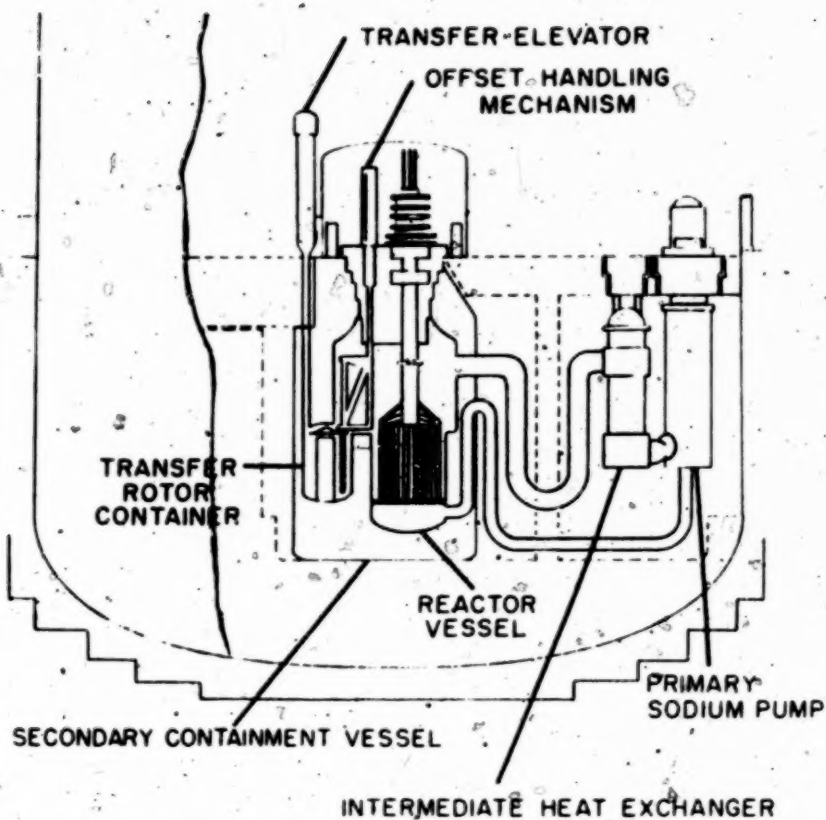


PLAN VIEW OF "REACTOR PROPER" SYSTEM

[5441]

5441

FIGURE B



ELEVATION VIEW OF "REACTOR PROPER" SYSTEM

[5442]

Application Exhibit XXII

[CONFORMING COPY]

LOAN AGREEMENT

AGREEMENT dated October 30, 1956 between POWER REACTOR DEVELOPMENT COMPANY, a membership corporation organized under the laws of Michigan (the "Company"); J. P. MORGAN & CO. INCORPORATED, a New York corporation, BANKERS TRUST COMPANY, a New York corporation, THE CHASE MANHATTAN BANK, a New York corporation, THE FIRST NATIONAL CITY BANK OF NEW YORK, a national banking association, and CITY BANK FARMERS TRUST COMPANY, a New York corporation, each acting severally and not jointly as trustee of various pension trusts, and BANKERS TRUST COMPANY as Trustee under agreement with American Brake Shoe Company dated May 17, 1940 (the "Banks"); and J. P. MORGAN & CO. INCORPORATED, as Agent for all the Banks (the "Agent").

WITNESSETH :**SECTION 1. Representation and Warranty**

The Company represents and warrants that it is a duly existing membership corporation validly organized and existing in good standing under the laws of the State of Michigan and the execution and delivery of this Agreement and of the Notes herein provided for are within its corporate authority, have been authorized by proper corporate

proceedings, and will not contravene any provision of law or of its charter, by-laws or any agreement or other instrument binding upon it.

SECTION 2. *The Loans*

2.1. *Total Loans.* Subject to the provisions of this Agreement, each Bank, acting in the capacity indicated above, agrees to make loans to the Company from time to time on or prior to December 31, 1958 in an aggregate principal amount not exceeding the amount set forth below opposite the name of such Bank:

J. B. Morgan & Co. Incorporated	\$ 3,750,000
Bankers Trust Company	3,675,000
The Chase Manhattan Bank	3,750,000
The First National City Bank of New York	2,025,000
City Bank Farmers Trust Company	1,725,000
Bankers Trust Company as Trustee under agreement with American Brake Shoe Company dated May 17, 1940	75,000

\$15,000,000

2.2. *Borrowings.* The Company agrees that it will borrow from the Banks, *pro-rata* in accordance with their respective commitments, at the following times and in the following amounts:

(a) Not less than \$2,000,000 on each of the following dates: March 31, June 30, September 30, and December 31, 1957; and

(b) Not less than \$1,750,000 on each of the following dates: March 31, June 30, September 30 and December 31, 1958.

At its option and upon not less than 65 days' written notice to the Agent, which shall give 60 days written notice to each Bank, the Company may borrow from the Banks, *pro rata* in accordance with their respective commitments, on one or more of the above borrowing dates an additional amount, (in a multiple of \$100,000), such additional amount not to exceed \$1,000,000 at any one time. Each additional borrowing shall reduce

1

the Banks' commitments *pro rata* and the Company's borrowing obligations set forth above in the inverse order of the dates for such borrowings.

All loans under this Agreement shall be evidenced by Notes substantially in the form of Annexes A and B hereto.

2.3. *Maturity and Interest Rate.* Each Note shall be dated the date of the borrowing, shall mature on July 1, 1970 and shall bear interest (on the basis of a 360-day year) at the rate of 4.35% per annum until maturity, payable semi-annually on each January 1 and July 1.

2.4. *Conditions to Loans.* The obligation of each Bank to make loans hereunder is subject to the receipt by such Bank of:

(a) A duly executed Note or Notes for the amount then being loaned by such Bank;

(b) A certificate dated the date of the borrowing and signed by the President or a Vice President and the Secretary or Treasurer or an Assistant Secretary or Assistant Treasurer of the Company to the effect that (i) no event of default specified in Section 5, and

no event which with the passing of time or giving of notice, or both, would occasion such an event of default has occurred and is continuing, (ii) the representation and warranty contained in Section 1 hereof is then true and correct, (iii) the Operating Agreement between the Company and the Atomic Energy Commission and the Steam Agreement between the Company and The Detroit Edison Company referred to in Section 4.2 have been duly executed and are in full force and effect, (iv) the orders, approvals and authorizations of governmental administrative agencies or other regulatory bodies specified in the opinions then required to be delivered pursuant to clause (vi) of paragraph (d) and clause (iii) of paragraph (f) of this Section 2.4 are in full force and effect and no proceedings to amend or rescind such orders are, to the knowledge of the signers, pending or threatened and (v) no litigation materially affecting the Company or the validity of this Agreement or the Notes or the Guaranty Agreement referred to in paragraph (e) of this Section 2.4 is, to the knowledge of the signers, pending or threatened, except as stated in said certificate;

(c) A counter part of a Guaranty Agreement (hereinafter called the "Guaranty Agreement") substantially in the form of Annex C hereto duly executed by the respective guarantors for the respective percentages set forth in said Annex C, or with such changes in guarantors and percentages as may be approved by the Banks;

(d) An opinion of Miller, Canfield, Paddock & Stone, counsel for the Company, or of other counsel

for the Company acceptable to the Banks, satisfactory to special counsel for the Banks, to the effect that (i) the Company is a duly existing membership corporation validly organized and in good standing under the laws of the State of Michigan, (ii) this Agreement has been duly authorized, executed and delivered by the Company and is its valid and binding obligation in accordance with its terms and is not in contravention of the certificate of incorporation or by-laws of the Company, (iii) the execution and delivery of this Agreement and the Notes are not in contravention of law or of any agreement or other instrument to which the Company is a party or by which it is bound, (iv) the Notes have been duly authorized, executed and delivered and constitute the valid and binding obligations of the Company in accordance with their terms, (v) the Guaranty Agreement has been duly authorized, executed and delivered by the guarantors and constitutes the valid and binding several obligation of each of the guarantors in accordance with its terms,

2

[5443]

(vi) all orders, approvals and authorizations (which shall be specified) of governmental administrative agencies or other regulatory bodies required in connection with the execution and delivery of this Agreement or of the Notes have been obtained and are in full force and effect;

(e) An opinion of special counsel for the Banks, to the effect specified in clauses (ii), (iv) and (v) of paragraph (d) above;

(f) An opinion of counsel for each guarantor, satisfactory to special counsel for the Banks, to the effect that (i) such guarantor is a duly existing corporation validly organized and in good standing under the laws of its state of incorporation, (ii) the Guaranty Agreement has been duly authorized, executed and delivered by such guarantor and is the valid and binding obligation of such guarantor in accordance with the terms of the Guaranty Agreement and is not in contravention of the certificate of incorporation or by-laws of such guarantor, or, to the best of such counsel's knowledge or belief, in contravention of any agreement or other instrument to which such guarantor is a party or by which it is bound, and (iii) all orders, approvals and authorizations (which shall be specified) of governmental administrative agencies or other regulatory bodies required in connection with the execution and delivery of the Guaranty Agreement by such guarantor have been obtained and are in full force and effect; and

(g) Photostatic copies of all orders, approvals and authorizations of governmental administrative agencies or other regulatory bodies specified in the opinions then required to be delivered pursuant to clause (vi) of paragraph (d) and clause (iii) of paragraph (f) of this Section 2.4.

In giving their opinions with respect to the validity of the Guaranty Agreement, Miller, Canfield, Paddock & Stone and special counsel for the Banks may rely, to the extent stated in their opinions, upon the opinions of counsel for the respective guarantors; provided that such

firm and special counsel shall make an independent review of the power and authority of the several guarantors to execute the Guaranty Agreement under the laws of their respective States of incorporation, their documents of incorporation and by-laws and their corporate resolutions and proceedings and shall so state in their opinions as to the validity of the Guaranty Agreement.

The obligation of each Bank to make loans hereunder is also subject to the condition that, if any litigation is specified in the certificate furnished pursuant to paragraph (b) of this Section 2.4, such litigation shall not, in the judgment of such Bank, be of such a character as to materially and adversely affect the value of the Notes as obligations of the Company guaranteed under the Guaranty Agreement or as to raise any material questions as to the validity of the Notes of the guaranties under the Guaranty Agreement.

2.5 Termination of Commitment to Borrow. At any time prior to the making of all loans provided for herein the Company may, on not less than 35 days' written notice to the Agent, which shall give 30 days' written notice to each Bank, elect to terminate its obligation to borrow under this Agreement, subject, however, to the following conditions:

- (a) Such termination may not be effected from or in anticipation of moneys obtained or borrowed by or for the account of the Company at an effective rate (calculated in accordance with accepted financial practice) of less than 4.35% per annum, provided, however, that nothing herein contained shall be construed to prohibit

the effectuation of such termination with moneys obtained from contributions of members of the Company; and

3

(b) No notice of election to terminate shall be effective unless upon the date fixed for termination of its obligation to borrow hereunder, the Company shall pay to the Agent for the account of each Bank funds sufficient to pay

(i) the commitment fee of such Bank accrued to the date fixed for termination of the commitment to borrow;

(ii) the principal amount of any Notes issued to such Bank and outstanding on the date of such termination, together with accrued interest thereon to the date fixed for termination of the commitment to borrow; and

(iii) an amount equal to 90 days' interest at the rate of 4.35% per annum (computed on a 360-day year basis) on the principal amount of any Notes issued to such Bank and outstanding on the date of such termination.

2.6. *Repayment of Loans.* If all the borrowings provided for in this Agreement are made, the Company agrees to make the following aggregate payments on the dates indicated in respect of the principal of the Notes outstanding on such dates:

(a) \$1,000,000 on each January 1 and July 1 in the years 1964 to 1969, both dates inclusive; and

(b) \$1,500,000 on January 1 and July 1, 1970.

2.7. *Prepayment of Loans.* If all the borrowings provided for in this Agreement are made the Company may, upon not less than 45 days written notice to the Agent, which shall give 40 days written notice to each Bank, prepay the Notes on the following terms:

(a) If prior to completion thereof the trustees of the Company elect to abandon construction of its plant at Monroe, Michigan, or if the Atomic Energy Commission exercises its right to acquire such plant pursuant to the terms of its proposed Operating Agreement with the Company, the Company may prepay all, but not a part, of the Notes at their principal amount and accrued interest to the date of prepayment; provided, however, that if such prepayment is made on or prior to December 31, 1958 the Company shall pay in addition an amount equal to 90 days' interest at the rate of 4.35% per annum (computed upon a 360-day year basis) on the principal amount of the Notes so prepaid;

(b) After December 31, 1958 the Company may prepay all, but not a part, of the outstanding Notes at the following percentages of their principal amount:

If prepaid during the 24 months ended December 31,

<i>Year</i>	<i>Percentage</i>
1960	104.35
1962	103.48
1964	102.61
1966	101.74
1968	100.87

and thereafter at 100%, in each case together with accrued interest to the date of prepayment. No such

prepayment may be effected, directly or indirectly, from or in anticipation of moneys obtained or borrowed by the Company at an effective rate (calculated in accordance with accepted financial practice) of less than 4.35% per annum; provided, however, that nothing herein contained shall be construed to prohibit such prepayment with moneys obtained from contributions of members of the Company.

4

[5444]

2.8. *Payments of Principal and Interest and Premium.* Payments of principal of and interest and premium, if any, on the Notes shall be made by the Company to the Agent for the account of the holders of the Notes and the Agent shall make distribution thereof among such holders. Payments so made by the Company to the Agent shall constitute a full discharge of the Company's liability with respect to, and each noteholder's right as against the Company to receive, its proportionate share of the amounts so paid. If any payment shall constitute payment in full of the principal of any Note, such payment shall be made by the Agent to the holder of the Note only upon surrender of such Note to the Agent. Any Note so surrendered to it shall be marked "Paid" by the Agent and delivered to the Company. The amount of any partial payment of principal on any Note shall be endorsed upon such Note by the holder thereof.

SECTION 3. *Commitment Fee*

In consideration of the Banks' several agreements to make the loans hereunder, the Company agrees to pay

to the Agent for the account of the Banks (i) on March 31, 1957 an amount equal to $\frac{1}{2}$ of 1% per annum (computed on a 360-day year basis) on the Banks' respective commitments hereunder from July 1, 1956 to and including March 31, 1957 and (ii) on each borrowing date after March 31, 1957 an amount equal to $\frac{1}{2}$ of 1% per annum on such portion of the Banks' respective commitments as is not evidenced by Notes executed and delivered prior to such borrowing date, computed from the last preceding borrowing date on a 360-day year basis.

SECTION 4. *Covenants.*

Until payment in full of the Notes, the Company agrees that:

4.1. *Financial Information.* It will furnish to the Agent for the account of each Bank, so long as it holds any Notes,

(a) Not later than 60 days after the end of each of the first three quarterly periods in each fiscal year, six copies of (i) statements of receipts and disbursements and of excess of receipts over disbursements of the Company and of statements of profit and loss of each of the guarantors of the Notes for that period, and (ii) a statement of financial condition of the Company as at the end of that period, setting forth in each case in comparative form the corresponding figures for the corresponding period of the preceding fiscal year, all in reasonable detail and certified, in the case of the Company statements, by an authorized financial officer of the Company and, in the case of the guarantors' statements, by an authorized financial

officer thereof, subject in each case to year-end adjustments;

(b) Not later than 120 days after the end of each fiscal year, six copies of (i) statements of receipts and disbursements and of excess of receipts over disbursements of the Company and of statements of profit and loss of each of the guarantors of the Notes for such year, and (ii) a statement of financial condition of the Company and balance sheets of each of the guarantors of the Notes as at the end of such year, setting forth in each case in comparative form the corresponding figures of the previous annual audit, all in reasonable detail and certified by independent public accountants of nationally recognized standing; and

(c) From time to time such additional information regarding its financial condition or business as the Agent, acting on behalf of itself or any Bank, may reasonably request.

The information required in paragraph (b) above with respect to any guarantor may be furnished by delivering to the Agent six copies of the annual report to stock-

5

holders of such guarantor provided any of such guarantor's securities are listed on the New York Stock Exchange. The Agent agrees to make prompt distribution to each Bank of the information received pursuant to this section.

4.2. *Negative Pledge.* It will not create or suffer to exist any pledge, mortgage or other lien on any of its assets (including its proposed Operating Agreement with

the Atomic Energy Commission and its proposed Steam Agreement with The Detroit Edison Company) now or hereafter owned, other than (a) liens in connection with workmen's compensation and other statutory obligations or encumbrances incurred in the ordinary course of business and (b) liens incidental to the conduct of its business or the ownership of its property which were not incurred in connection with the borrowing of money or the obtaining of advances or the voluntary securing of obligations of the Company and which do not in the aggregate materially detract from the value of its property or materially impair the use thereof in the operation of its business.

4.3. *Borrowed Money.* It will not incur or be obligated upon, either directly or indirectly by way of guaranty, suretyship, or otherwise, any indebtedness for borrowed money or advances other than (a) the Notes, (b) indebtedness for money borrowed otherwise than from members of the Company not exceeding \$5,000,000 in the aggregate at any one time outstanding provided all such indebtedness is guaranteed as to principal and interest by all or some of the guarantors of the Notes under a form of guaranty substantially similar to the Guaranty Agreement, (c) indebtedness to members of the Company or others for advances or loans provided such indebtedness is subordinated to the Notes and any indebtedness permitted by clause (b) of this Section 4.3. in accordance with or in substantially the same terms as provided in the Guaranty Agreement with respect to subordinated indebtedness, and (d) indebtedness for other money borrowed, not exceeding \$2,000,000 at any one time outstanding, provided all such indebtedness matures on demand or within one year after the date it is

incurred and is not renewable or extendable at the option of the Company for a period ending more than one year after the date it is incurred and is not payable from the proceeds of other indebtedness which may be incurred pursuant to the provisions of any revolving credit agreement or other similar agreement.

4.4. *Appointment of Trustee.* Upon the request in writing of the holders of 66 $\frac{2}{3}$ % in principal amount of the Notes outstanding, the Company will appoint a trustee in respect of the Notes and will execute and deliver an indenture containing substantially the same provisions, where appropriate, as this Agreement and such additional provisions as are customary in instruments of such character. Concurrently with the execution of said indenture the Company will execute and will arrange for the authentication by said trustee of new notes issued under said indenture and will exchange said notes for equal aggregate principal amounts of the Notes upon surrender thereof.

SECTION 5. *Defaults*

5.1. *Events of Automatic Default.* In the event that

(a) the Company shall fail to pay any Note when due, or any instalment of interest thereon within 10 business days after the due date thereof; or

(b) the Company shall fail to observe or perform any term, covenant or agreement contained in any agreement or obligation by which it is bound and which evidences borrowed money, other than subordinated indebtedness permitted hereunder, for such period of time as would accelerate, or would permit the holder

[5445]

thereof or of any obligations issued thereunder, to accelerate, the maturity thereof or of any obligation issued thereunder; or

(c) the Company shall admit in writing its inability to pay its debts; or suffer a receiver or trustee for it or substantially all of its property to be appointed and if appointed without its consent not to be discharged within 30 days; or suffer proceedings under any law relating to bankruptcy, insolvency or the reorganization or relief of debtors to be instituted by or against it, and if contested by it not to be dismissed or stayed within 60 days; or suffer any writ of attachment or execution or any similar process to be issued or levied against substantially all of its property or suffer any judgment to be entered against it in an amount in excess of \$100,000 which is not released, satisfied, stayed, bonded or vacated within 30 days after its issue, levy or entry; then, and in every such event, the Notes shall forthwith become due and payable without presentment, demand, protest or other notice of any kind, all of which are hereby expressly waived.

5.2. *Other Events of Default.* In the event that

(a) the Company shall fail to perform any covenant or agreement herein contained (other than those specified in clause 5.1(a) above) for 30 days after written notice of default has been given to it by any of the Banks or by the Agent; or

(b) the Company shall have made any representation or warranty in Section 1 which shall prove to

have been false in any material respect at the date as of which given; or

(c) the Company shall fail to observe or perform any term, covenant or agreement contained in any agreement or obligation by which it is bound and which evidences subordinated indebtedness permitted hereunder for such period of time as would accelerate, or would permit the holder thereof or of any obligations issued thereunder to accelerate, the maturity thereof or of any obligation issued thereunder;

then and in every such event, any of the Banks may, or upon receipt of a request in writing or by telegraph from the holder of any Note the Agent shall, by written or telegraphic notice to the Company shall declare all Notes outstanding to be and they shall thereupon forthwith become due and payable without presentment, demand, protest or other notice of any kind, all of which are hereby expressly waived. The Agent shall forthwith notify all holders of Notes of the taking of any such action by it. Any Bank giving notice pursuant to paragraph (a) above shall send a copy of such notice to each of the other Banks and to the Agent which, if there are other holders of Notes, shall thereupon send copies thereof to each such holder.

SECTION 6. *The Agent*

6.1. *Appointment of Agent.* Each of the Banks hereby appoints, and each subsequent holder of Notes by his acquisition thereof shall be deemed irrevocably to have appointed J. P. Morgan & Co. Incorporated as Agent, to accept payments of commitment fees and payments on account of principal of or interest and premium, if any, on the Notes and to take such action on its behalf and to

exercise such powers hereunder and under the Guaranty Agreement as are specifically delegated to it by the terms hereof and of said Guaranty Agreement, together with such powers as are reasonably incidental thereto. The Agent shall not be responsible to any holder of Notes for any recitals or statements

7

or warranties or representations herein or in the Guaranty Agreement or be bound to ascertain or inquire as to the performance or observance of any of the terms, conditions, covenants or agreements on the part of the Company to be performed pursuant to this Agreement or the Guaranty Agreement or on the part of said guarantors to be performed pursuant to the Guaranty Agreement and neither it nor any of its directors, officers or agents shall be liable for any action taken or omitted to be taken in connection herewith or in connection with the Guaranty Agreement except for their own negligence or willful misconduct.

6.2. *Payments to Agent.*⁹ The Company will reimburse the Agent for all reasonable out-of-pocket expenses (including fees and disbursements of special counsel for the Banks) incurred by it in connection with this Agreement and the Guaranty Agreement and the loans made under this Agreement, and will pay any taxes, assessments or charges (including penalties and interest) assessed or made by any governmental authority by reason of the execution and delivery of this Agreement or of the Notes to be executed and delivered hereunder or the execution and delivery of the Guaranty Agreement.

SECTION 7. *Miscellaneous*

7.1. *Notices.* Except where otherwise provided, notices, statements, requests and demands hereunder shall be deemed to have been given or made when mailed or delivered to the telegraph company, addressed to the addressee at its address given below:

Power Reactor Development Company	1911 First Street Detroit 26, Michigan
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J. P. Morgan & Co. Incorporated	23 Wall Street New York 8, N. Y.
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Bankers Trust Company	16 Wall Street New York 15, N. Y.
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The Chase Manhattan Bank	18 Pine Street New York 15, N. Y.
--------------------------	--------------------------------------

The First National City Bank of New York	55 Wall Street New York 15, N. Y.
--	--------------------------------------

City Bank Farmers Trust Company	22 William Street New York 15, N. Y.
---------------------------------	---

Bankers Trust Company As Trustee under agreement with American Brake Shoe Company dated May 17, 1940	16 Wall Street New York 15, N. Y.
---	--------------------------------------

7.2. *Obligations of Banks Several.* The obligations of the Banks hereunder are several and not joint and no provision hereof shall be deemed to constitute any of the parties hereto a partnership, association or other entity.

7.3. *New York Law.* This Agreement and the Notes shall be deemed to be contracts made under and shall be

construed in accordance with and be governed by the laws of the State of New York.

7.4. *Changes, Waivers, etc.* At the request of the Company and with the consent of the holders of not less than 66 $\frac{2}{3}$ % in aggregate principal amount of the Notes at the time outstanding, this Agreement may be amended for the purpose of adding any provisions hereto or changing in any manner or eliminating any of the provisions hereof or for the purpose of modifying in any manner the rights of the holders of the Notes; provided, however, no such amendment shall (a) extend the fixed maturity of any Note or the earlier repayments required by Section 2.6, or reduce the principal amount thereof, or

8

[5446]

reduce the rate or extend the time of payment of interest thereon without the consent of the holder of each Note so affected, or (b) reduce the aforesaid percentage of Notes, the consent of the holders of which is required for any such amendment, without the consent of the holders of all Notes then outstanding. No failure or delay by the holder of any Note or by the Agent in exercising any right, power or privilege hereunder or under the Guaranty Agreement shall operate as a waiver thereof, nor shall any single or partial exercise thereof preclude any other or further exercise thereof or the exercise of any other right, power or privilege.

7.5. *Exchange of Notes.* At the option of any holder thereof, a Note or Notes may be exchanged for two or more Notes of like tenor in an aggregate principal amount equal to the unpaid balance of the Notes surrendered and

the Company agrees to execute and deliver such Notes upon request of such holder.

7.6. *Investment Representations.* Each of the Banks represents that it is purchasing its proportionate share of the Notes for the account of certain pension trusts for investment and not with a view to, or for sale in connection with, the distribution of Notes or interests or participations therein nor with any present intention of distributing or selling such Notes or interests or participations.

7.7. *No Recourse.* It is an express condition of this Agreement that, except as provided in the Guaranty Agreement, no recourse whatsoever shall be had under this Agreement against any member, officer, director or employee as such of, or contributor to, the Company, or of any successor corporation, either at law or in equity, and whether by the enforcement of any assessment or penalty or by virtue of any statute, constitution or rule of law, or otherwise. All such rights and claims are expressly waived and released as a condition of and in consideration for the execution of this Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year above set forth.

POWER REACTOR DEVELOPMENT COMPANY

By WALKER L. CISLER

President

J. P. MORGAN & CO. INCORPORATED

As Trustee of various pension trusts

By L. S. HASKINS

Vice President

BANKERS TRUST COMPANY

As Trustee of various pension trusts

By C. WADSWORTH FARNUM

Vice President

THE CHASE MANHATTAN BANK

As Trustee of various pension trusts

By JAMES J. O'BRIEN

Asst. Vice President

THE FIRST NATIONAL CITY BANK

OF NEW YORK

As Trustee of various pension trusts

By H. B. MACADAMS

Vice President

CITY BANK FARMERS TRUST COMPANY

As Trustee of various pension trusts

By H. B. MACADAMS

Vice President

BANKERS TRUST COMPANY

As Trustee under agreement with

American Brake Shoe Company

dated May 17, 1940

By C. WADSWORTH FARNUM

Vice President

J. P. MORGAN & CO. INCORPORATED

As Agent

By JOHN M. MEYER, JR.

Sr. Vice President

5447

[5447]

ANNEX A

[FORM OF FACE OF NOTE]

\$.....

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On July 1, 1970, for value received, POWER REACTOR DEVELOPMENT COMPANY (herein called the "Company") a membership corporation organized under the laws of the State of Michigan, promises to pay to the order of

at the office of J. P. Morgan & Co. Incorporated, Agent, 23 Wall Street, New York & N. Y. the principal sum of \$

in lawful money of the United States and to pay interest thereon from the date hereof until maturity in like money at said office at the rate of 4.35% per annum (on the basis of a 360-day year) on the first days of January and July in each year.

This Note is one of the Notes referred to in the Loan Agreement dated October 30, 1956 between the undersigned and J. P. Morgan & Co. Incorporated, Bankers Trust Company, The Chase Manhattan Bank, The First National City Bank of New York, City Bank Farmers Trust Company, each acting as Trustee of various pension trusts, Bankers Trust Company as Trustee under Agreement with American Brake Shoe Company dated May 17, 1940, and J. P. Morgan & Co. Incorporated, as Agent, to which reference is made for the terms and provisions thereof, and for additional rights and limitations of such rights of the maker and payee hereof thereunder, including, but without limitation, provisions for making payments of principal,

interest and premium, with respect hereof, to the Agent for the account of the holder hereof, provisions for mandatory payments on account of the principal hereof and provisions for the optional prepayment hereof by the Company and for the acceleration of the maturity hereof on the occurrence of certain events as therein specified. Said Loan Agreement contains provisions for the amendment thereof at the request of the Company and with the consent of the holders of not less than 66 $\frac{2}{3}$ % in aggregate principal amount of the Notes at the time outstanding for the purpose of adding provisions to or changing provisions of said Loan Agreement or for the purpose of modifying in any manner the rights of the holders of the Notes; provided, however, no such amendment shall (a) extend the fixed maturity of any Note or the earlier repayments required by Section 2.6 of said Loan Agreement, or reduce the principal amount thereof, or reduce the rate or extend the time of payment of interest thereon without the consent of the holder of each Note so affected, or (b) reduce the aforesaid percentage of Notes, the consent of the holders of which is required for any such amendment, without the consent of the holders of all Notes then outstanding.

At the option of the holder hereof, this Note may be exchanged for two or more Notes of like tenor in an aggregate principal amount equal to the unpaid balance of this Note and the Company agrees to execute and deliver such Notes to the holder hereof upon request.

POWER REACTOR DEVELOPMENT COMPANY

By

ANNEX B

[FORM OF REVERSE OF NOTE]

By a Guaranty Agreement dated , 1956 with the banks named on the face hereof, the Company and J. P. Morgan & Co. Incorporated, as Agent, each of the following companies has severally and unconditionally guaranteed the due and punctual payment of the percentage set opposite its name below of the principal of and interest of this Note and each of the Notes referred to in the Loan Agreement described on the face hereof and of the indebtedness represented thereby as and when the same shall respectively become due and payable, whether at maturity of by declaration or otherwise pursuant to the terms of the Notes and Loan Agreement:

<i>Name of Guarantor</i>	<i>Percentage Guaranteed</i>
Central Hudson Gas & Electric Corporation ..	.80
The Cincinnati Gas & Electric Company	1.00
Columbus and Southern Ohio Electric Company	1.00
Consumers Power Company	10.00
Delaware Power & Light Company	1.20
The Detroit Edison Company	58.84
Iowa-Illinois Gas and Electric Company .....	.48
Long Island Lighting Company	2.48
Philadelphia Electric Company	10.00
Potomac Electric Power Company	3.20
Rochester Gas and Electric Corporation	1.80
The Southern Company	8.00
Wisconsin Electric Power Company	1.20

[5448]

ANNEX C

[FORM OF GUARANTY AGREEMENT]

GUARANTY AGREEMENT

Guaranty Agreement dated _____, 1956, between CENTRAL HUDSON GAS & ELECTRIC CORPORATION, THE CINCINNATI GAS & ELECTRIC COMPANY, COLUMBUS AND SOUTHERN OHIO ELECTRIC COMPANY, CONSUMERS POWER COMPANY, DELAWARE POWER & LIGHT COMPANY, THE DETROIT EDISON COMPANY, IOWA-ILLINOIS GAS AND ELECTRIC COMPANY, LONG ISLAND LIGHTING COMPANY, PHILADELPHIA ELECTRIC COMPANY, POTOMAC ELECTRIC POWER COMPANY, ROCHESTER GAS AND ELECTRIC CORPORATION, THE SOUTHERN COMPANY, WISCONSIN ELECTRIC POWER COMPANY, each acting severally and not jointly, and herein called the "Guarantors"; J. P. MORGAN & CO. INCORPORATED, BANKERS TRUST COMPANY, THE CHASE MANHATTAN BANK, THE FIRST NATIONAL CITY BANK OF NEW YORK, CITY BANK FARMERS TRUST COMPANY, each acting severally and not jointly as trustee of various pension trusts, and BANKERS TRUST COMPANY as Trustee under agreement with American Brake Shoe Company dated May 17, 1940, herein called the "Banks"; J. P. MORGAN & CO. INCORPORATED, as Agent for all the Banks, herein called the "Agent"; and POWER REACTOR DEVELOPMENT COMPANY, herein called the "Company".

WHEREAS, the Company has executed and delivered to the Banks and the Agent a Loan Agreement dated October 30, 1956, in the form of Exhibit A hereto, herein called the "Loan Agreement", and proposes to borrow thereunder \$15,000,000 to be evidenced by its promissory notes (being in the form set forth in Exhibit A and herein called the "Notes") maturing July 1, 1970 and bearing interest at 4.35% per annum; and

WHEREAS, each of the Guarantors is a member or a parent of a member of the Company or a contributor to the Company and each of the Guarantors is interested in furthering the work of the Company; and

WHEREAS, in order to induce each of the Banks and the Agent to execute said Loan Agreement and to induce the Banks to make the loans therein provided for, each of the Guarantors is willing to guarantee, severally and not jointly, the payment when due of a percentage of the principal of and interest on the Notes as hereinafter provided and

WHEREAS, due corporate proceedings have been taken by each Guarantor and all necessary authorizations or approvals of governmental administrative agencies or other regulatory bodies have been obtained with respect to the execution on its behalf of this agreement and its unconditional several guaranty herein provided for;

The Guarantors severally covenant and agree as follows:

FIRST: Each Guarantor hereby severally agrees with the Banks and the Agent to guarantee and does hereby unconditionally guarantee, the due and punctual payment

of the percentage set opposite its name below of the principal of and interest on each and every one of the Notes and of the indebtedness represented thereby, as and when the same shall respectively become due and payable, whether at maturity or by declaration or otherwise, pursuant to the provisions of the Notes and of the Loan Agreement, and in case the Company shall fail to pay the principal of or interest on any of the

-13-

Notes and of the indebtedness represented thereby, as and when the same shall respectively become due and payable, whether at maturity or by declaration or otherwise, pursuant to the provisions of the Notes and the Loan Agreement, each Guarantor severally covenants and agrees duly and punctually to pay, in the manner provided in Section 28 of the Loan Agreement, the percentage of the same set opposite its name below:

<i>Name of Guarantor</i>	<i>Percentages Guaranteed</i>
Central Hudson Gas & Electric Corporation ..	.80
The Cincinnati Gas & Electric Company	1.00
Columbus and Southern Ohio Electric Company ..	1.00
Consumers Power Company	10.00
Delaware Power & Light Company	1.00
The Detroit Edison Company	58.84
Iowa-Illinois Gas and Electric Company .....	.48
Long Island Lighting Company	2.48
Philadelphia Electric Company	10.00
Potomac Electric Power Company	3.20
Rochester Gas and Electric Corporation	1.80
The Southern Company	8.00
Wisconsin Electric Power Company	1.20

Each Guarantor agrees that every payment made by it on account of principal of or interest on the Notes pursuant to its guaranty herein shall constitute a contribution by it to the Company to aid it in its scientific research and development and otherwise to further the work of the Company and in no event shall be deemed an advance or loan to the Company which is subject to repayment or which creates a claim of any kind against the Company.

SECOND: Each Guarantor hereby authorizes and directs the Company, in the name and on behalf of such Guarantor, to cause to be endorsed on the back of each Note executed and delivered by it a legend in the form set forth in Annex B to the Loan Agreement.

THIRD: Each Guarantor assents to the terms, covenants and conditions of the Notes and of the Loan Agreement and irrevocably waives presentation, demand or protest of any of the Notes and any and all notice of any such presentation, demand or protest. The obligation of each Guarantor hereunder or under its guaranty of a percentage of the principal of and interest on each of the Notes shall not be affected by the recovery of any judgment against the Company or any successor corporation, or by the levy of execution under any such judgment, or by any action or proceeding taken by the Agent or by the holder or holders of any of the Notes, either under the Notes or under the Loan Agreement, for the enforcement thereof or in the exercise of any right or power given or conferred thereby, or by any delay, failure, or omission upon the part of the Agent to enforce any of the rights or powers given or conferred by the Loan Agreement or this agreement, or by any delay, failure or omission on the part of

any holder or holders of the Notes to enforce any right of such holder or holders against the Company or any successor corporation, or by any action of the Agent, or by any holder or holders of said Notes in granting indulgence to the Company or to any successor corporation or in granting any extension of time of payment, or in waiving or acquiescing in any default upon the part of the Company or any successor corporation under the Notes,

14

[5449]

or under the Loan Agreement, or by any breach, alteration, change or enforcement of any of the terms and provisions of the Loan Agreement or otherwise in respect thereof or by any other act or delay or failure to act or by any other thing which may or might in any manner or to any extent vary the risk of any Guarantor under this agreement or under the guaranty of its percentage of the principal of and interest on said Notes, in accordance herewith; it being the purpose and intent of the parties hereto that the said several guaranties and the several obligations of the Guarantors hereunder shall be absolute and unconditional under any and all circumstances, and shall not be discharged except by payment as herein provided, and then only to the extent of such payment or payments.

FOURTH: Each Guarantor agrees that its right to payment of principal of and interest on any indebtedness that may hereafter exist from the Company to them is hereby expressly subordinated to the prior payment of the Notes and any other guaranteed indebtedness hereafter incurred by the Company as permitted by clause (b) of Section 4.3

of the Loan Agreement (the Notes and any such other guaranteed indebtedness being herein called "Guaranteed Indebtedness") as follows:

Upon any distribution of assets of the Company upon any dissolution, winding up, liquidation or reorganization of the Company, whether in bankruptcy, insolvency or receivership proceedings or upon an assignment for the benefit of creditors or any other marshalling of the assets and liabilities of the Company or otherwise,

(a) the holders of Guaranteed Indebtedness shall first be entitled to receive payment in full of the principal thereof and the interest due thereon before the Guarantors or other members of the Company (hereinafter collectively called the "members of the Company") are entitled to receive any payment upon the principal of or interest on any indebtedness from the Company to them; and

(b) any payment or distribution of assets of the Company of any kind or character, whether in cash, property or securities to which the members of the Company would be entitled except for these provisions shall be paid by the trustee or agent or other person making such payment or distribution (or by the members of the Company if received by them) direct to the holders of Guaranteed Indebtedness or their representative or representatives ratably according to the aggregate amounts remaining unpaid on account of the principal of and interest on Guaranteed Indebtedness held or represented by each, to the extent necessary to make payment in full of all Guaranteed Indebtedness remaining unpaid, after giving effect to any concurrent

payment or distribution to the holders of Guaranteed Indebtedness.

Nothing contained herein is intended to or shall impair, as between the Company, its creditors other than the holders of Guaranteed Indebtedness and the members of the Company the obligation of the Company, which is unconditional and absolute, to pay to such members the principal of and interest on any indebtedness from the Company to them as and when the same shall become due and payable in accordance with its terms, or to affect the relative rights of the members and creditors of the Company other than the holders of Guaranteed Indebtedness, nor shall anything herein prevent any member from exercising all remedies otherwise permitted by applicable law upon default in the payment of any indebtedness of the Company to it, subject to the rights, if any, under these provisions of the holders of Guaranteed Indebtedness in respect of cash, property or securities of the Company received upon the exercise of any such remedy.

FIFTH: Paragraphs First to Fourth of this agreement are made by each Guarantor for the benefit of each of the Banks, the Agent and the several holders from time to time of

the Notes and of any other Guaranteed Indebtedness of the Company, and may be enforced directly by the holders of the Notes and such other Guaranteed Indebtedness or by any of them, from time to time, as often as occasion may arise, or by the Agent for the benefit of the holders of

the Notes. The Agent, however, shall not be under any obligation to take any action for the enforcement of this agreement or of the guaranty of any Guarantor hereunder, unless requested to take such action by a writing signed by or on behalf of the holders of not less than 25% in principal amount of the Notes then outstanding and tendered reasonable indemnity against the expenses and liabilities which it may incur in connection with or by reason of such action.

SIXTH: The Agent shall not be responsible for the recitals herein. The Agent shall not be accountable in respect of the form, validity or enforceability of this agreement, or of any of the provisions hereof, nor of the several guaranties of the Guarantors hereunder, and it makes no representation with respect thereto. All rights of action under this agreement or under the said guaranties may be enforced by the Agent without the possession of any of the Notes, or the production thereof on the trial or other proceedings relative thereto.

SEVENTH: It is an express condition of each of the several guaranties provided for in this agreement that no recourse whatsoever shall be had under said guaranty against any stockholder, officer, director or employee as such of any Guarantor, or of any successor corporation, either at law or in equity, and whether by the enforcement of any assessment or penalty or by virtue of any statute, constitution or rule of law, or otherwise. All such rights and claims are expressly waived and released as a condition of and in consideration for the execution of this agreement and of said legend endorsed on the Notes.

EIGHTH: All covenants and agreements herein contained shall bind and inure to the benefit of the successors of the parties hereto respectively, and any successor Agent duly acting as such under the terms of the Loan Agreement or any trustee acting under any indenture pursuant to which Notes have been issued shall be deemed to be a successor of the Agent under the provisions of this agreement.

NINTH: This agreement shall be deemed to be a contract made under and shall be construed in accordance with and governed by the laws of the State of New York. Neither this agreement nor any provision hereof may be changed, waived, discharged or terminated orally but only by an instrument in writing signed by the party against which enforcement of the change, waiver, discharge or termination is sought.

IN WITNESS WHEREOF the parties hereto have executed this agreement as of the day and year above set forth.

CENTRAL HUDSON GAS & ELECTRIC CORPORATION

By

Vice President

THE CINCINNATI GAS & ELECTRIC COMPANY

By

Vice President

16

[5450]

COLUMBUS AND SOUTHERN OHIO ELECTRIC COMPANY

By

Vice President

441

CONSUMERS POWER COMPANY

By
Vice President

DELAWARE POWER & LIGHT COMPANY

By
Vice President

THE DETROIT EDISON COMPANY

By
Vice President

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

By
Vice President

LONG ISLAND LIGHTING COMPANY

By
Vice President

PHILADELPHIA ELECTRIC COMPANY

By
Vice President

17

POTOMAC ELECTRIC POWER COMPANY

By
Vice President

ROCHESTER GAS AND ELECTRIC CORPORATION

By
Vice President

THE SOUTHERN COMPANY

By
Vice President

WISCONSIN ELECTRIC POWER COMPANY

By
Vice President

J. P. MORGAN & Co. INCORPORATED

As Trustee of various pension trusts

By
Vice President

BANKERS TRUST COMPANY

As Trustee of various pension trusts

By
Vice President

THE CHASE MANHATTAN BANK

As Trustee of various pension trusts

By
Vice President

18

[5451]

THE FIRST NATIONAL CITY BANK OF NEW YORK

As Trustee of various pension trusts

By
Vice President

5451

CITY BANK FARMERS TRUST COMPANY

As Trustee of various pension trusts

By
Vice President

BANKERS TRUST COMPANY

As Trustee under agreement with American
Brake Shoe Company dated May 17, 1940

By
Vice President

J. P. MORGAN & CO. INCORPORATED

As Agent

By
Vice President

19

[5474]

Application Exhibit XXIV

(CONTRIBUTION COMMITMENT LETTERS FROM
PRDC MEMBERS; ONLY ONE SAMPLE PRINTED)

ALABAMA POWER COMPANY

BIRMINGHAM 2, ALABAMA

October 23, 1956

Power Reactor Development Company

1911 First Street

Detroit 26, Michigan

Gentlemen:

As one of the companies interested in the experimental
power reactor project of Power Reactor Development Com-

pany (PRDC) to determine the soundness and economy of producing electrical energy for public utility service by means of a nuclear power reactor of the type which PRDC is constructing, and in order to promote the scientific research purposes of PRDC and to aid in advancing learning and technology in the field of atomic energy, and in consideration of the pledges of others similarly interested aggregating with this commitment not less than \$21,000,000:

We hereby agree to contribute to PRDC the sum of \$160,000 per year for five years, commencing with the year 1956, subject to call by PRDC and payable from time to time within 30 days after each such call.

Such payments shall be cumulative, i.e. any payment not called in a given year may be added in whole or in part to the payment called in any subsequent year. Any payments already made to PRDC at the date of this commitment shall be credited against the earliest call.

This commitment shall be subject to the obtaining by us of satisfactory approval and consent of any public regulatory agencies having jurisdiction.

Yours very truly,

ALABAMA POWER COMPANY

By WALTER BASELD
Executive Vice President

[5529]

Application Exhibit XXVII

PRDC ENRICO FERMI ATOMIC POWER PLANT PROJECT
CONSTRUCTION ESTIMATE

<i>Description</i>	<i>Material</i>	<i>Labor</i>	<i>Total</i>
<i>Structures and Improvements</i>			
<i>General Fill</i>			
Dredge and grade fill on site ..		\$ 135,000	\$ 135,000
Riprap	\$ 12,000	17,000	29,000
<i>Site Improvements</i>			
Finish grading and gravel	9,000	6,000	15,000
Roads and parking area	20,000	45,000	65,000
Railroad track	18,000	22,000	40,000
Yard Piping all services	18,000	27,000	45,000
Storm sewers, drains and catch basins	10,000	20,000	30,000
Yard lighting	5,000	10,000	15,000
Fencing	6,000	4,000	10,000
Landscaping	5,000	10,000	15,000
Total Material and Labor ..	\$ 103,000	\$ 296,000	\$ 399,000
Contingencies	10,300	29,600	39,900
Total	\$ 113,300	\$ 325,600	\$ 438,900
<i>Reactor Plant Structures</i>			
Reactor containment vessel excavation foundations and external concrete work	\$ 228,400	\$ 242,600	\$ 471,000
Containment vessel	735,250		735,250
Internal structural and con- crete work and equipment decay tanks	841,525	511,490	1,353,015
Element decay and storage structure	228,585	199,865	428,450
Repair shop and shipping	86,365	54,795	141,160
Office building	125,000	150,000	275,000

5530

Boiler rooms	95,000	125,000	220,000
Service building	200,000	200,000	400,000
Hot cave building	15,000	20,000	35,000
Sodium storage and inert gas building	110,000	115,000	225,000
Control room relay and switch-gear rooms	35,000	45,000	80,000
Electrical equipment room	35,000	48,000	83,000
Connecting passageways between buildings	7,000	9,000	16,000

/31,56

[5530]

Description	Material	Labor	Total
<i>Reactor Plant Structures (Contd)</i>			
Stack	\$ 75,000	\$ 10,000	\$ 85,000
Fan rooms and stack	15,000	10,000	25,000
Total Material and Labor ..	\$ 2,832,125	\$1,740,750	\$ 4,572,875
Contingencies	283,275	174,050	457,325
Total	\$ 3,115,400	\$1,914,800	\$ 5,030,200

Reactor Plant Equipment

Primary shield tank including steel and graphite shielding gas cooling system and reactor vessel supports	\$ 382,500	\$ 95,000	\$ 477,500
Reactor vessel including steel shielding internal structures, heating system	1,107,300	87,500	1,194,800
Rotating plug including shield disks, index system, controls, drives, Nak and gas seals ..	556,350	70,000	626,350
Control rods including fast neutron poison	213,800	15,000	228,800
Control rod actuators	282,100	25,000	307,100
Ionization chambers	30,000	6,000	36,000

5530

Overhead crane with gripper 150 t, and auxiliary 25 t, re- mote control from operating floor	175,000	25,000	200
Offset element handling me- chanism	266,900	60,000	326
Element memory system	220,000	80,000	300
Element transfer rotor and drive	125,000	35,000	160
Element transfer cask and car	400,000	10,000	410
Element transfer and cleanup	200,000	40,000	240
Underwater hydraulic opr cart	80,000	20,000	100
Decay storage racks	550,000	130,000	680
Decay building gas and water systems and disassembly machinery	290,000	70,000	360
chinery	290,000	70,000	360
Total Material and Labor .. \$	4,878,950	\$ 768,500	\$ 5,647
Contingencies	731,750	115,500	847
Total	\$ 5,610,700	\$ 884,000	\$ 6,493

*Liquid Metal System**Primary System Na to Na*

Sodium pumps including sump tanks and drives and heat- ing	\$ 480,000	\$ 40,000	520
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12/31/56

[5531]

<i>Description</i>	<i>Material</i>	<i>Labor</i>	<i>T</i>
<i>Primary System Na to Na (Contd)</i>			
Pump tank insulation	\$ 15,000	\$	\$ 15
Intermediate heat exchanger	925,000	30,000	955
Heat exchanger insulation ..	15,000		45
Main loop piping including blanket flow and overflow piping with supports	165,000	65,000	230

6" blanket flow control valves (bellows seal)	30,000	3,000	33,000
Secondary containment and leak detection system	50,000	20,000	70,000
Pipe insulation including boron carbide covering	20,000		20,000
Overflow tank	20,000	5,000	25,000
Overflow pumps and motors ..	100,000	25,000	125,000
Total Material and Labor .. \$	1,820,000	\$ 188,000	\$ 2,008,000
Contingencies	546,000	66,000	612,000
Total	\$ 2,366,000	\$ 254,000	\$ 2,620,000

Secondary System Na to Water

Steam generators	\$ 600,000	\$ 50,000	\$ 650,000
Steam generator insulation ..	20,000		20,000
Steam generator supports	3,000	1,500	4,500
Sodium pumps and drives	390,000	15,000	405,000
Pump insulation	7,000		7,000
Pump supports	2,000	1,500	4,500
Main loop piping, supply and return including supports ..	102,000	30,000	132,000
Pipe heating and controls	14,000	6,000	20,000
Secondary containment and leak detection system	40,000	20,000	60,000
Pipe insulation	15,000		15,000
Total Material and Labor .. \$	1,194,000	\$ 124,000	\$ 1,318,000
Contingencies	358,000	37,000	395,000
Total	\$ 1,552,000	\$ 161,000	\$ 1,713,000

Liquid Metal Storage

Storage tanks, three 15,000 gal, three 6000 gal	\$ 150,000	\$ 30,000	\$ 180,000
Tank heating	60,000	30,000	90,000
Tank supports	8,000	5,000	13,000
Handling and purification system including Na cooling ing	200,000	50,000	250,000
Total Material and Labor .. \$	418,000	\$ 115,000	\$ 533,000

[5532]

<i>Description</i>	<i>Material</i>	<i>Labor</i>	<i>Total</i>
Contingencies	\$ 125,000	\$ 34,000	\$ 159,000
Total	\$ 543,000	\$ 149,000	\$ 692,000
<i>Other Reactor Plant Equipment and Facilities</i>			
Hot cave structure and equipment	\$ 208,000	\$ 56,000	\$ 264,000
Conventional physics and chemical laboratory equipment	145,000	5,000	150,000
Health physics instruments and equipment	160,000	40,000	200,000
Health physics wiring and conduit	15,000	60,000	75,000
Inert gas system including vent gas system	170,000	80,000	250,000
Reactor plant instrumentation and control boards	700,000	150,000	850,000
Instrument wiring and tubing	100,000	100,000	200,000
Steam and feedwater piping from steam generator outlet to steam generator enclosure wall	150,000	80,000	230,000
Steam generator instrumentation including control air compressor, tubing etc	40,000	60,000	100,000
Accessory electric equipment	616,000	291,000	907,000
Emergency power supply equipment	150,000	15,000	165,000
Total Material and Labor ..	\$ 2,454,000	\$ 937,000	\$ 3,391,000
Contingencies	736,000	281,000	1,017,000
Total	\$ 3,190,000	\$ 1,218,000	\$ 4,408,000

Initial Operating Supplies

Neutron source	\$ 18,000	\$ 2,000	\$ 20,000
Initial core elements	233,000	23,000	256,000
Initial blanket elements	377,000	143,000	520,000
Initial sodium, inert gas, Nak etc	250,000	15,000	265,000
Total Material and Labor	\$ 878,000	\$ 183,000	\$ 1,061,000
Contingencies	263,000	54,000	317,000
Total	\$ 1,141,000	\$ 237,000	\$ 1,378,000

31/56

[5533]

<i>Description</i>	<i>Material</i>	<i>Labor</i>	<i>Total</i>
<i>Miscellaneous Reactor Plant Equipment and Facilities</i>			
Office furniture and equip- ment	18,000	2,000	20,000
Transportation equipment ..	5,000		5,000
First aid equipment	2,000		2,000
Maintenance tools and equip- ment	80,000	20,000	100,000
Waste disposal equipment ...	24,000	6,000	30,000
Shipping casks	120,000	6,000	126,000
Miscellaneous systems and power plant equipment	195,000	35,000	230,000
Cold element assembly equip- ment	80,000	11,000	91,000
Total Material and Labor	\$ 524,000	\$ 80,000	\$ 604,000
Contingencies	78,000	12,000	90,000
Total	\$ 602,000	\$ 92,000	\$ 694,000
Total Material and Labor	\$18,233,400	\$5,235,400	\$23,468,800

Construction plant, equip-
ment rental, tools and fee ... \$ 2,977,000.

5533

Spare parts, control rods, rod actuators, core and blanket elements	16
Preoperation testing after construction	35
Personnel training	500
Initial operation low to full load	55
Interest during construction	1,800
Engineering services and ex- penses	900
Local taxes etc	51
Working capital	1,17
TOTAL ESTIMATED PLANT COST	\$32,400

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[5534]

PRDC ENRICO FERMI ATOMIC POWER PLANT PROJECT
TOTAL ESTIMATED PLANT COST BY YEARS

(Figures are in Thousands of Dollars)

	1956	1957	1958	1959	1960	Total
Site Improvements	\$335.0	\$ 65.0			\$ 38.9	\$ 438.9
Structures	400.0	2,300.0	\$1,500.0	\$ 635.2	200.0	5,030.2
Equipment, Reactor Plant		1,590.0	1,410.0	3,216.7	278.0	6,494.7
Liquid Metal Sys- tem		500.0	2,000.0	2,525.0		5,025.0
Other Reactor Plant Equipment		200.0	2,000.0	2,208.0		4,408.0
Initial Supplies ..		300.0	1,000.0	78.0		1,378.0
Miscellaneous ..		50.0	200.0	300.0	144.0	694.0
Subtotal	\$735.0	\$5,005.0	\$8,110.0	\$ 8,957.9	\$ 660.9	\$23,468.8
Construction Plant	75.0	550.0	775.0	1,202.0	375.0	2,977.0
Spare Parts				160.0		160.0
Preoperating Tests				300.0	50.0	350.0
Personnel Training				350.0	150.0	500.0
Initial Low Load Operation				160.0	450.0	550.0
Interest		150.0	450.0	600.0	600.0	1,800.0
Local Taxes		8.9	65.0	150.0	295.3	519.2
Engineering	75.0	250.0	350.0	200.0	25.0	900.0
Subtotal	\$885.0	\$5,963.9	\$9,750.0	\$12,019.9	\$2,606.2	\$31,225.0
Working Capital ..						1,175.0
						\$32,400.0

5535

Total Estimated Plant Cost by Years Excluding Working Capital of \$1,175.0
and Allowance of \$3,000.0 for Equipment and Devices to be Furnished by
Atomic Power Development Associates

	1956	1957	1958	1959	1960	Total
Subtotal	\$885.0	\$5,063.9	\$7,650.0	\$12,019.9	\$2,606.2	\$28,225.0
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[5535]

PRDC ENRICO FERMI ATOMIC POWER PLANT PROJECT

Estimated Construction Administrative and
Research and Development Costs During
Construction, and Pre-Operational Testing
Period (1956-1960)

(Figures are in Thousands of Dollars)

Estimated Plant Cost Excluding Working Capital and Allowance for equipment and devices to be furnished by Atomic Power Development Associates)	\$28,225.0
Estimated Cost Savings to PRDC of equipment and devices to be furnished by Atomic Power Development Associates.	3,000.0
Working Capital	1,175.0
Administrative Expenses during Construction and Pre-Operational Testing (1956-1960)	1,816.0
Research and Development Costs during Construction and Pre- Operational Testing (1956-1960)	
To be paid for by PRDC	\$5,000.0
To be furnished in kind by APDA	4,000.0
Total Overall Costs	\$43,216.0

5536

[5536]

Application Exhibit XXVIII

(SEE ALSO LATER EXHIBIT, APPLICATION
EXHIBIT XLIII, TR. PP. 6065-69)

**POWER REACTOR DEVELOPMENT COMPANY
ENRICO FERMI ATOMIC POWER PLANT PROJECT
STATEMENT OF SOURCE AND APPLICATION OF
CASH DURING CONSTRUCTION PERIOD**

Arthur Andersen & Co.
Detroit

December 31, 1956

[5537]

**POWER REACTOR DEVELOPMENT COMPANY
ENRICO FERMI ATOMIC POWER PLANT PROJECT
STATEMENT OF SOURCE AND APPLICATION OF
CASH DURING CONSTRUCTION PERIOD**

At the request of the Company, the attached statements have been prepared showing the source and application of cash during the construction period which period includes the years 1956 through the years of pre-operational testing, 1960. Power Reactor Development Company has received an opinion from its tax counsel, Mr. Roswell Magill, that it is exempt from Federal income taxation as a non-profit scientific institution under Section 501 of the Internal Revenue Code of 1954. A request for ruling that it is such a tax-exempt organization is now pending before the Internal Revenue Service. Schedule 1 is a statement of source and

application of cash during the construction period based on the assumption that the company will not be subject to Federal income tax liability during this period.

In addition, a statement of source and application of cash has been prepared on the assumption that, contrary to the opinion of its tax counsel, favorable action will not be received on its pending request for ruling. Schedule 2, showing source and application of cash during the construction period, is based on the assumption that there will be Federal income tax liability.

[5538]

Cash sources are based upon the commitment contracts in existence between the Company and its members, and upon the Loan Agreement between the Company and J. P. Morgan & Co., Incorporated, as agent for certain banks.

Cash applications are based upon data furnished by Commonwealth Associates, Inc., architects and engineers for the project, and by Company personnel. Commonwealth Associates, Inc., furnished the estimated annual plant costs. Company personnel furnished the estimated remaining annual cash applications such as direct research and development cost, administrative expense, interest expense, and local taxes.

In determining the Federal income tax liability shown on Schedule 2, contributions by the members are treated as taxable income to the Company. Tax deductible expenses are cash expenditures other than those capitalized as plant cost. In accordance with an opinion of tax counsel for the

Company, cost of the plant (exclusive of the estimated site improvement costs) in excess of the cost of conventional facilities is considered as research and development expense. Cost of a conventional steam plant of the same capacity is estimated by Company engineers to be approximately \$13,200,000.

SCHEDULE NO. 1

STATEMENT OF SOURCE AND APPLICATION OF CASH
DURING CONSTRUCTION PERIOD
ASSUMING THAT COMPANY HAS NO FEDERAL INCOME TAX LIABILITY

Particulars	Line No.	Y e a r					Total
		1 9 5 6	1 9 5 7	1 9 5 8	1 9 5 9	1 9 6 0 (test year)	
Source of cash-							
Contributions (see Note 1)	1	\$2,051,400	\$ -	\$ 2,572,500	\$13,369,900	\$5,546,200	\$23,540,000
Long-term bank loans	2	-	8,000,000	7,000,000	-	-	15,000,000
Total source of cash	3	\$2,051,400	\$8,000,000	\$ 9,572,500	\$13,369,900	\$5,546,200	\$38,540,000
Application of cash-							
Plant expenditures (see Schedule No. <u>4</u>) <i>line 5</i>	4	\$1,135,000	\$5,205,000	\$ 7,435,000	\$11,619,900	\$2,326,900	\$27,721,800
Interest	5	-	150,000	450,000	600,000	600,000	1,800,000
Property taxes	6	-	8,900	65,000	150,000	295,300	519,200
Direct research and development cost	7	-	1,500,000	2,500,000	1,000,000	-	5,000,000
Total application of cash (see Note 2)	8	\$1,135,000	\$6,863,900	\$10,450,000	\$13,369,900	\$3,222,200	\$35,041,000
Net cash increase (decrease) during year	9	\$ 916,400	\$1,136,100	\$ (877,500)	\$ -	\$2,324,000	\$ 3,499,000
Cash balance - end of year	10	\$ 916,400	\$2,052,500	\$ 1,175,000	\$ 1,175,000	\$3,499,000	

NOTES:

(1) A contribution in kind to the extent of \$1,000,000 is reflected in the contributions to be received in 1958 as the goods and services to be contributed will be required in that year under the construction schedule.

(2) Total estimated project consists of-

Total application of cash by PRDC (see Line No. 8)
Working capital

\$35,041,000
1,175,000

Total PRDC cash requirement

\$36,216,000

Value to PRDC of research, development, test devices and equipment to be provided by Atomic Power Development Associates

7,000,000

Total estimated project

\$43,216,000

EXHIBIT XXVIII

SCHEDULE NO. 2STATEMENT OF SOURCE AND APPLICATION OF CASHDURING CONSTRUCTION PERIODASSUMING THAT COMPANY HAS FEDERAL INCOME TAX LIABILITY

<u>Particulars</u>	<u>Line No.</u>	<u>Y e a r</u>					<u>Total</u>
		<u>1 9 5 6</u>	<u>1 9 5 7</u>	<u>1 9 5 8</u>	<u>1 9 5 9</u>	<u>1 9 6 0</u> (test year)	
Source of cash-							
Contributions (see Note)	1	\$2,051,400	\$ -	\$2,572,500	\$13,369,900	\$5,546,200	\$23,540,000
Long-term bank loans	2	-	8,000,000	7,000,000	-	-	15,000,000
	3	\$2,051,400	\$8,000,000	\$9,572,500	\$13,369,900	\$5,546,200	\$38,540,000
Application of cash-							
Plant expenditures (see Schedule No. <u>4</u>)	4	\$1,135,000	\$5,205,000	\$7,435,000	\$11,619,900	\$2,326,900	\$27,721,800
Interest	5	-	150,000	450,000	600,000	600,000	1,800,000
Property taxes	6	-	8,900	65,000	150,000	295,300	519,200
Direct research and development cost	7	-	1,500,000	2,500,000	1,000,000	-	5,000,000
Federal income tax payments (refunds) (see Schedule No. <u>3</u>) <i>line 9</i>	8	149,300	697,200	(846,500)	-	503,100	503,100
	9	\$1,284,300	\$7,561,100	\$9,603,500	\$13,369,900	\$3,725,300	\$35,544,100
Cash increase (decrease) during year	10	\$ 767,100	\$ 438,900	\$ (31,000)	\$ -	\$1,820,900	\$ 2,995,900
Cash balance - end of year	11	\$ 767,100	\$1,206,000	\$1,175,000	\$ 1,175,000	\$2,995,900	

NOTE: A contribution in kind to the extent of \$1,000,000 is reflected in the contributions to be received in 1958 as the goods and services to be contributed will be required in that year under the construction schedule.

[5541]

5541

EXHIBIT XXVIII

SCHEDULE NO. 4

CALCULATION OF FEDERAL INCOME TAX PAYMENTS DURING CONSTRUCTION PERIOD

Particulars	Line No.	Y e a r					Total
		1 9 5 6	1 9 5 7	1 9 5 8	1 9 5 9	1 9 6 0 (test year)	
Contributions	1	\$2,051,400	\$ -	\$ 2,572,500	\$13,369,900	\$5,546,200	\$23,540,000
Expenses deductible for tax purposes-							
Direct research and development cost	2	\$ -	\$ 1,500,000	\$ 2,500,000	\$ 1,000,000	\$ -	\$ 5,000,000
Portion of plant expenditures considered to be research and development cost (see Schedule No. 4) Line 2	3	412,900	2,653,200	3,837,800	5,998,000	1,181,000	14,082,900
Interest payments	4	-	150,000	450,000	600,000	600,000	1,800,000
Property taxes	5	-	8,900	65,000	150,000	295,300	519,200
Total	6	\$ 412,900	\$ 4,312,100	\$ 6,852,800	\$ 7,748,000	\$2,076,300	\$21,402,100
Net taxable income (loss)	7	\$1,638,500	\$(4,312,100)	\$(4,280,300)	\$ 5,621,900	\$3,469,900	\$ 2,137,900
Federal income tax liability	8	\$ 846,500	\$ -	\$ -	\$ -	\$1,106,200	
Federal income tax payments (refunds)	9	\$ 149,300	\$ 697,200	\$ (846,500)	\$ -	\$ 503,100	\$ 503,100

CALCULATION OF PLANT EXPENDITURES AND PORTION CONSIDERED RESEARCH AND DEVELOPMENT COSTBASED ON ESTIMATED EXPENDITURES

Particulars	Line No.	Y e a r					Total
		<u>1 9 5 6</u>	<u>1 9 5 7</u>	<u>1 9 5 8</u>	<u>1 9 5 9</u>	<u>1 9 6 0</u> (test year)	
Total estimated plant cost per Commonwealth Associates, Inc.	1	\$ 885,000	\$5,063,900	\$7,650,000	\$12,019,900	\$2,606,200	\$28,225,000
Adjustments-							
Deduct- Interest during construction Included in estimated plant cost	2	-	(150,000)	(450,000)	(600,000)	(600,000)	(1,800,000)
Deduct- Property taxes included in estimated plant cost	3	-	(8,900)	(65,000)	(150,000)	(295,300)	(519,200)
Add- Administration expenses	4	250,000	300,000	300,000	350,000	16,000	1,816,000
Plant expenditures	5	\$1,135,000	\$5,205,000	\$7,435,000	\$11,619,900	\$2,326,900	\$27,721,800
Deduct- Site improvements	6	(335,000)	(65,000)	-	-	(38,900)	(438,900)
Deduct- Estimated cost of conventional steam plant	7	(387,100)	(2,486,800)	(3,597,200)	(5,621,900)	(1,107,000)	(13,200,000)
Portion of plant expenditures considered research and development cost	8	\$ 412,900	\$2,653,200	\$3,337,800	\$ 5,998,000	\$1,181,000	\$14,082,900

(5913)

APPLICATION EXHIBIT VII-B

SPECIAL NUCLEAR MATERIALS - REQUIRED AND PRODUCED

Weekly Subassembly Removal Program

	1955	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Reactor Power, mw	--	--	143	300	300	350	350	400	430	430	430	430	430	430	430	430	430
Plant Factor, %	--	--	35	60	45	70	70	75	75	70	80	80	80	80	80	80	80
Fuel Burn-up, % Total Atoms of Alloy	--	--	1.0	1.0	1.5	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Special Nuclear Materials																	
Fuel Alloy																	
(a) - Required from AEC (Kg)	2,493.3	--	1,616.1	3,549.0	3,287.6	4,986.3	4,109.6	3,890.1	4,657.5	3,369.8	4,109.6	4,931.1	4,219.2	4,109.6	4,712.3	4,134.3	4,657.5
(b) - Returned to AEC as Scrap (Kg)	198.4	--	323.0	717.2	657.0	990.5	821.1	777.5	930.4	673.1	821.3	945.5	813.2	821.3	941.7	947.0	930.4
(c) - Fabrication Losses (Kg)	2.0	--	1.3	2.9	2.6	4.0	3.1	3.1	3.7	2.7	3.3	3.9	3.1	3.3	3.9	3.5	3.7
(d) - Required for Reactor Cycling																	
(a)-(b)-(c)																	
1. Subassemblies	91	--	59	131	120	192	150	142	170	123	150	180	151	150	172	162	170
2. Uranium (Kg)	1,992.9	--	1,292.1	2,968.9	2,028.0	3,945.3	3,285.0	3,109.4	3,723.0	2,693.7	3,285.0	3,942.0	3,372.6	3,285.0	3,764.4	3,517.4	3,723.0
(e) - Returned to AEC after irradiation																	
1. Subassemblies	--	--	--	101	142	140	168	142	151	142	150	162	162	150	150	172	151
2. Uranium (Kg)	--	--	--	2,175.8	3,045.7	2,976.2	3,567.0	2,992.3	3,144.9	2,959.1	3,128.5	3,375.6	3,374.8	3,125.0	3,125.0	3,543.3	3,145.6
(f) - Difference: (a)-(b)-(c)-(e) (Kg)	1,992.9	--	1,292.1	693.1	1,009.6	1,009.6	(282.0)	117.5	574.1	(265.6)	156.5	566.4	(2.2)	166.0	641.2	(35.5)	577.4
(g) - Year End Inventory																	
1. In Reactor (Kg)	--	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9
2. In Decay Storage (Kg)	--	--	--	1,467.3	1,248.3	1,730.1	1,992.9	1,576.3	1,554.9	1,554.9	1,992.9	1,554.9	1,467.3	1,817.7	2,036.7	1,730.1	1,379.7
3. In Fabrication (Kg)	1,992.9	--	1,292.1	481.8	219.0	657.0	--	416.1	451.1	438.0	--	432.2	744.6	394.2	657.0	744.6	1,511.1
4. Total (Kg)	1,992.9	1,992.9	3,285.0	3,942.0	4,340.2	4,340.0	3,985.8	3,985.8	4,401.9	3,985.8	3,985.8	4,340.0	4,204.8	4,204.8	4,686.6	4,686.6	4,943.7
(h) - Plutonium from Irradiated Subassemblies (Kg)	--	--	--	8.85	15.75	21.94	27.45	28.87	39.26	36.82	36.66	42.03	42.18	39.04	34.86	44.70	39.14
(i) - U-235 Consumed (Kg)	--	--	--	27.29	48.36	67.78	94.76	88.67	122.71	113.72	119.48	130.22	130.95	120.98	120.50	138.76	122.13
Total Blanket																	
(a) - Required from AEC (Kg)	51,466.0	--	3,813.4	13,030.3	14,663.4	30,717.4	54,442.7	32,162.0	34,547.4	35,749.0	34,099.4	70,095.3	34,346.8	34,562.0	43,107.5	34,161.4	66,211.0
(b) - Returned to AEC as Scrap (Kg)	10,292.1	--	762.1	2,604.0	3,729.7	6,134.7	11,079.2	6,127.3	6,904.0	7,144.1	7,613.9	14,007.9	6,863.9	6,906.9	8,614.6	7,626.3	13,231.7
(c) - Fabrication Losses (Kg)	51.0	--	3.0	10.4	14.9	24.5	46.7	25.7	27.6	28.6	30.5	56.0	27.5	27.7	34.5	30.5	52.9
(d) - Required for Reactor Cycling																	
(a)-(b)-(c)																	
1. Subassemblies	637	--	79	227	284	454	752	450	491	479	522	902	482	482	592	530	852
2. Uranium (Kg)	41,122.9	--	3,048.3	10,415.9	14,914.4	24,554.6	46,716.4	25,709.0	27,615.4	24,576.3	30,155.4	56,031.4	27,155.4	27,627.4	34,458.4	30,505.0	52,926.4
(e) - Returned to AEC after irradiation																	
1. Subassemblies	--	--	--	121	262	344	400	479	479	450	490	554	468	450	550	588	431
2. Uranium (Kg)	--	--	--	4,205.7	12,394.4	14,252.1	20,995.1	50,334.9	27,249.2	25,630.4	24,136.5	32,370.0	54,241.7	25,291.7	32,330.1	34,058.4	23,908.5
(f) - Difference: (a)-(b)-(c)-(e) (Kg)	41,122.9	--	3,048.3	6,210.2	7,530.0	6,302.5	25,721.0	(21,625.9)	326.6	2,945.9	2,348.9	23,661.4	(26,746.3)	2,335.7	2,128.3	(3,553.4)	29,017.9
(g) - Year End Inventory																	
1. In Reactor (Kg)	--	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9
2. In Decay Storage (Kg)	--	--	--	4,966.7	6,103.7	10,955.1	37,446.5	13,872.0	14,975.5	16,106.7	15,412.1	36,492.5	10,057.1	17,287.5	16,998.9	12,086.3	41,761.3
3. In Fabrication (Kg)	41,122.9	--	3,048.3	4,285.3	5,650.2	7,052.6	6,221.6	5,051.1	4,191.1	5,927.2	8,184.0	10,950.6	10,839.4	5,871.8	4,183.9	9,425.8	8,698.5
4. Total (Kg)	41,122.9	41,122.9	44,171.2	50,375.4	52,876.8	59,130.6	94,791.0	60,046.0	60,299.5	63,156.8	65,419.2	88,966.0	62,019.8	64,282.2	66,305.6	62,635.0	91,582.7
(h) - Plutonium from Irradiated Subassemblies (Kg)	--	--	--	6.01	24.68	44.76	60.65	119.13	43.11	74.62	46.46	111.55	159.97	73.36	104.95	117.24	70.24

• 10% Mo - 90% U (27% Enriched in U-235)

Schedule VII-B

1975	1976	1977	1978	1979	1980	1981
430	430	430	430	430	430	-
80	80	80	80	80	80	-
3.0	3.0	3.0	3.0	3.0	3.0	-
4,164.3	4,135.3	4,328.8	4,219.2	4,657.5	3,369.8	-
832.2	887.0	865.1	843.2	930.8	673.4	-
3.3	3.5	3.5	3.4	3.7	2.7	-
152	162	158	154	170	123	-
3,328.8	3,547.4	3,660.2	3,372.6	3,723.0	2,693.7	-
142	140	150	184	180	142	91
2,958.8	3,375.6	3,125.1	3,437.5	3,749.5	2,959.1	3,895.9
370.0	172.2	335.1	(464.9)	(26.5)	(265.4)	(1,895.9)
1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	1,992.9	-
1,730.1	1,730.1	1,992.9	1,949.1	1,379.1	1,992.9	-
1,379.7	1,379.7	1,292.1	678.9	1,029.3	-	-
5,102.7	5,102.7	5,277.9	4,620.9	4,401.3	3,985.8	-
36.92	41.97	38.99	46.81	46.91	36.86	23.60
114.05	130.19	120.89	145.28	145.60	113.85	73.37
36,400.1	38,515.6	40,499.7	38,592.2	59,489.1	30,796.0	-
7,274.2	7,697.0	8,093.5	7,712.3	11,888.4	6,154.3	-
29.1	30.8	32.4	30.9	47.5	24.6	-
504	534	554	530	776	423	-
29,096.8	30,787.8	32,373.8	30,849.0	47,553.2	24,617.1	-
84.8	490	638	484	560	820	275
53,636.5	27,593.2	38,532.8	26,221.2	31,747.5	51,708.2	15,482.7
(24,589.7)	3,194.6	(6,159.0)	4,627.8	15,805.7	(27,091.1)	(15,482.7)
41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	41,122.9	-
15,197.1	21,701.5	12,418.7	17,453.7	30,388.1	15,529.5	-
10,511.3	7,118.3	10,118.3	9,625.5	6,392.3	-	-
66,831.3	69,942.7	63,659.9	68,202.1	83,903.3	56,652.4	-
161.12	83.87	123.71	85.62	104.53	159.83	46.75

[5919]

Monthly Subassembly Removal Program (Cont.)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Atomic Blanket																	
(a) - Required from ABC (Kg)	3,154.0	--	2,044.5	4,539.5	4,158.3	6,306.8	5,197.9	4,920.7	5,991.0	4,262.3	5,198.0	6,237.5	5,336.6	5,198.0	5,960.3	5,613.8	5,991.0
(b) - Returned to ABC as Scrap (Kg)	630.2	--	408.6	907.2	831.0	1,260.4	1,038.8	983.4	1,177.1	451.8	1,038.8	1,246.5	1,064.5	1,038.8	1,191.1	1,121.9	1,177.3
(c) - Fabrication Losses (Kg)	3.1	--	1.6	3.6	3.3	5.0	4.1	3.9	4.7	3.1	4.2	5.0	4.3	4.2	4.4	4.5	4.7
(d) - Required for Reactor Cycling																	
(a)-(b)-(c)	91	--	59	131	120	182	150	142	170	123	150	190	154	150	172	162	170
1. Subassemblies	2,580.7	--	1,634.3	3,628.7	3,324.0	5,041.4	4,155.0	3,933.4	4,709.0	3,407.1	4,155.0	4,986.0	4,265.9	4,155.0	4,764.4	4,497.1	4,709.0
2. Uranium (Kg)	--	--	--	101	142	140	168	142	151	142	150	162	162	150	150	172	151
(e) - Returned to ABC after Irradiation	--	--	--	2,794.6	3,927.9	3,970.3	4,644.0	3,923.1	4,164.9	3,920.5	4,141.4	4,172.6	4,172.6	4,141.3	4,141.4	4,749.6	4,169.0
1. Subassemblies	--	--	--	834.1	(603.9)	1,171.1	(489.0)	10.1	540.1	(513.4)	13.6	513.4	(206.8)	13.7	623.0	(262.2)	540.0
2. Uranium (Kg)	2,520.7	--	1,634.3	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7
(f) - Differences: (a)-(b)-(c)-(e) (Kg)	2,520.7	--	1,634.3	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7
(g) - Year End Inventory	--	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7
1. In Reactor (Kg)	--	--	--	1,955.9	1,578.9	2,188.3	2,520.7	1,994.4	1,966.7	1,966.7	2,520.7	1,966.7	1,855.9	2,299.1	2,576.1	2,188.3	1,745.1
2. In Decay Storage (Kg)	2,520.7	--	1,634.3	609.4	777.0	331.0	--	526.3	1,080.3	554.0	--	1,052.6	941.8	498.6	831.0	941.8	1,911.3
3. In Fabrication (Kg)	2,520.7	2,520.7	4,155.0	4,986.0	4,376.6	5,540.0	5,041.4	5,041.4	5,507.7	5,041.4	5,041.4	5,540.0	5,318.4	5,318.4	5,927.8	5,650.8	6,177.1
4. Total (Kg)	--	--	--	3.11	5.53	7.72	9.65	10.14	13.79	12.93	13.59	14.77	14.82	13.72	13.65	14.79	13.75
(h) - Plutonium from Irradiated Subassemblies (Kg)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Radial Blanket																	
(a) - Required from ABC (Kg)	48,312.0	--	1,768.9	8,490.8	14,505.1	24,411.0	53,244.4	27,241.3	28,656.4	31,486.7	32,901.8	63,857.8	29,010.2	49,364.0	37,117.2	32,549.0	60,320.0
(b) - Returned to ABC as Scrap (Kg)	9,661.9	--	353.5	1,696.8	2,898.7	4,878.3	10,640.4	5,443.9	5,726.7	6,292.3	6,575.1	12,761.4	5,997.4	5,868.1	7,423.5	6,504.1	12,054.1
(c) - Fabrication Losses (Kg)	47.9	--	1.4	6.8	11.6	19.5	42.6	21.8	22.9	25.2	26.3	51.0	23.2	23.5	29.7	26.0	43.2
(d) - Required for Reactor Cycling																	
(a)-(b)-(c)	56	--	20	96	164	276	602	308	324	356	372	722	328	332	420	368	682
1. Subassemblies	38,602.2	--	1,444.0	6,787.2	11,594.8	19,513.2	42,561.4	21,775.6	22,906.8	25,169.2	26,300.4	51,045.4	23,189.6	23,472.4	29,694.0	26,017.6	48,217.4
2. Uranium (Kg)	--	--	--	20	120	204	232	658	328	308	340	396	706	300	400	416	280
(e) - Returned to ABC after Irradiation	--	--	--	1,444.0	5,376.1	3,133.9	26,210.0	(24,636.0)	(213.5)	3,459.3	2,335.3	23,148.0	(26,579.5)	2,322.0	1,505.3	(3,291.2)	28,477.9
1. Subassemblies	--	--	--	1,444.0	5,376.1	3,133.9	26,210.0	(24,636.0)	(213.5)	3,459.3	2,335.3	23,148.0	(26,579.5)	2,322.0	1,505.3	(3,291.2)	28,477.9
2. Uranium (Kg)	--	--	--	1,444.0	5,376.1	3,133.9	26,210.0	(24,636.0)	(213.5)	3,459.3	2,335.3	23,148.0	(26,579.5)	2,322.0	1,505.3	(3,291.2)	28,477.9
(f) - Differences: (a)-(b)-(c)-(e) (Kg)	38,602.2	--	1,444.0	5,376.1	3,133.9	5,131.4	26,210.0	(24,636.0)	(213.5)	3,459.3	2,335.3	23,148.0	(26,579.5)	2,322.0	1,505.3	(3,291.2)	28,477.9
(g) - Year End Inventory	--	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2
1. In Reactor (Kg)	--	--	--	3,110.8	4,524.8	8,766.8	34,925.8	11,877.6	13,008.8	14,140.0	13,291.6	34,925.8	8,201.2	14,988.4	14,422.8	9,894.0	40,016.2
2. In Decay Storage (Kg)	38,602.2	--	1,444.0	3,676.4	5,373.2	6,221.6	6,221.6	4,524.8	3,110.8	5,373.2	8,484.0	9,898.0	5,373.2	7,352.4	8,484.0	6,787.2	6,787.2
3. In Fabrication (Kg)	38,602.2	38,602.2	40,016.2	45,389.4	48,500.2	53,590.6	79,749.6	55,004.6	54,721.8	58,115.4	60,377.8	83,426.0	56,701.4	58,963.8	60,377.8	56,984.2	45,405.6
4. Total (Kg)	--	--	--	2.90	23.15	41.04	51.00	108.99	69.32	65.69	72.87	99.78	145.15	59.64	91.30	102.15	56.49
(h) - Plutonium from Irradiated Subassemblies (Kg)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Plutonium																	
Contained in Irradiated Core and Blanket Elements Returned to ABC (Kg)	--	--	--	14.86	44.43	70.74	88.10	148.00	122.37	115.44	123.12	156.58	202.15	112.40	143.81	141.94	109.38
Barren-10																	
Required From ABC (Kg)	35	0	0	1.5	2.1	2.7	2.4	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3

END-2/27/56

Exhibit VII-B
 Sheet 2

1975	1976	1977	1978	1979	1980	1981
5,267.2	5,613.8	5,475.2	5,336.6	5,991.0	4,268.3	- -
1,054.6	1,121.9	1,094.2	1,066.5	1,177.3	851.8	- -
4.2	4.5	4.4	4.7	4.7	3.4	- -
152	162	159	154	170	123	- -
1,210.4	4,487.4	4,376.6	4,265.8	4,709.0	3,407.1	- -
142	162	150	184	180	142	91
3,920.4	4,472.7	4,111.3	5,040.4	4,969.5	3,920.5	2,512.4
290.0	14.7	235.3	(814.6)	(260.5)	(513.4)	(2,512.4)
2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	2,520.7	- -
2,188.3	2,188.3	2,520.7	2,465.3	1,745.1	2,520.7	- -
1,745.1	1,745.1	1,634.3	858.7	1,301.9	- -	- -
6,454.1	6,454.1	6,675.1	5,844.7	5,567.7	5,041.4	- -
12.97	14.75	13.70	16.45	16.48	12.95	8.29
31,132.9	32,901.8	35,024.5	33,255.6	53,598.1	26,533.7	- -
6,221.6	6,575.1	6,999.3	6,645.8	10,711.1	5,302.5	- -
84.9	26.3	28.0	26.6	42.8	21.2	- -
352	372	396	376	606	300	- -
21,486.4	26,300.4	27,997.2	26,583.2	42,844.2	21,210.0	- -
706	328	488	300	380	678	184
49,766.1	23,120.5	34,391.5	21,140.8	26,778.0	47,787.7	12,970.3
(24,579.7)	3,179.9	(6,394.3)	5,442.4	16,066.2	(26,577.7)	(12,970.3)
38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	38,602.2	- -
13,008.9	19,513.2	6,998.0	14,988.4	34,643.0	13,008.8	- -
8,766.2	5,373.2	8,434.0	8,766.8	5,090.4	- -	- -
60,377.2	63,488.6	56,984.2	62,357.4	78,335.6	51,611.0	- -
148.15	69.12	110.01	69.17	88.05	116.88	38.46
198.04	125.84	162.70	122.43	151.44	196.69	70.35
3.3	3.3	3.3	3.3	3.3	3.3	3.3

[5921]

Application Exhibit XXXVI

(CONTRIBUTION COMMITMENT LETTER FROM
PRDC MEMBERS FOR YEAR 1961; ONLY ONE
SAMPLE PRINTED)

**CENTRAL HUDSON GAS & ELECTRIC
CORPORATION
POUGHKEEPSIE, N. Y.**

ERNEST R. ACKER**President****July 1, 1957****Power Reactor Development Company****1911 First Street****Detroit 26, Michigan****Gentlemen:**

As one of the companies interested in the experimental power reactor project of Power Reactor Development Company (PRDC) to determine the soundness of economy of producing electric energy for public utility service by means of a nuclear power reactor of the type PRDC is constructing, and in order to promote the scientific research purposes of PRDC, and to aid in advancing learning and technology in the field of atomic energy and in consideration of the pledges of others similarly interested, we hereby agree to contribute to PRDC the sum of \$40,000 in the year 1961, subject to call by PRDC at any time during that year and payable within thirty (30) days after such call.

Yours very truly,**ERA/jm****ERNEST R. ACKER**

[6046].

Application Exhibit XXXIX**(INTERNAL REVENUE SERVICE TAX RULING
LETTER)****U. S. TREASURY DEPARTMENT****WASHINGTON 25****Jul 19 1957**

Office of
Commissioner of Internal Revenue

Address Reply to
Commissioner of Internal Revenue
Washington 25, D. C.
and Refer to
T:R:C
WMD

Power Reactor Development Company
1100 Dime Bldg.
Detroit 26, Michigan

Attention: Walker L. Cisler, President**Gentlemen:**

This is in reply to your letter dated December 28, 1955, with enclosures, and subsequent correspondence, in which you requested rulings as follows:

- (1) That your company PRDC is exempt from Federal income tax under section 501(c)(6) of the Internal Revenue Code of 1954,
- (2) That income received by PRDC from the sale of steam made by the experimental reactor and the sale of the by-product plutonium will be exempt from income taxes, and

- (3) That dues and contributions paid or incurred to PRDC in cash or kind by its Members will constitute ordinary and necessary expenses, deductible by such Members in computing their respective taxable incomes under section 162 of the Code.

In letters dated February 7, 1957, and April 24, 1957, you requested that rulings with respect to your requests (1) and (2) above be held in abeyance, pending the issuance of rulings as follows:

- (3) (As amended) That amounts paid or incurred in cash or kind to PRDC by a Member, i.e., Central Hudson Gas and Electric Corporation, constitute research and experimental expenses deductible by such Member under section 174(a) of the Code, and

- (4) That Membership payments received by PRDC do not constitute gross income to PRDC.

[6047]

A ruling with respect to request (3) as amended, above, will be made the subject of a separate letter addressed to Central Hudson Gas and Electric Corporation, Poughkeepsie, New York.

You state PRDC was organized on August 30, 1955, as a Michigan non-profit Membership corporation to function as a business league in studying, developing, designing, constructing and operating experimental nuclear power reactors for the demonstration of the practicality of the use of nuclear energy for the generation of electric energy in response to the announcement of the United States Atomic Energy Commission (A. E. C.) of Power Demon-

stration Reactor Program to bring private resources into the development of engineering information on the performance of nuclear power reactors and to advance the time in which nuclear power will become economically competitive.

According to your Articles of Incorporation, you will operate as a business league of members of industries to engage in all activities necessary to acquire knowledge and the ability to successfully demonstrate and disseminate such information to your Members and others regarding the use of nuclear energy, other by-products and applications thereof; to contract with others to engage in experiments, research, fabrication and construction and other work to advance such purposes; and to receive membership fees, dues, contributions and payments in cash or services from members and others. No part of your net earnings shall inure to benefit of any Member or private individual or corporation upon dissolution or other termination of your existence and any property remaining shall be distributed to a corporation organized and operated exclusively for educational or scientific purposes and not for profits to do further research and development of the use of atomic energy for peaceful purposes. At no time shall any of your property be returned to the original incorporators or other Members, or to any donors or contributors.

According to your By-Laws, as submitted under date of July 3, 1956, Members shall be your incorporators and such other legal or natural persons as shall be admitted by action of the Board of Trustees or of the Members; any individual, corporation or partnership engaged in a business or profession interested in your objectives shall be

eligible for membership, subject to clearance by the A.E.C.; all Members shall be voting Members and each Member shall be entitled to one vote on any proposition presented; except as the Board of Trustees may otherwise provide, resignation or termination of membership shall not release any financial commitment for additional funds (in addition to annual dues) for which the Member may voluntarily contract with you in writing. Your business, property and affairs shall be managed and controlled by a Board of Trustees. The Trustees shall be natural persons elected by the Members, provided that not more than one Trustee may be selected from any Member. A person otherwise eligible for election as a Trustee need not be Member. Among other duties the Board of Trustees shall adopt an annual budget. Financially, you shall receive annual dues

[6048]

from Members, not to exceed \$5,000 per calendar year from each, additional funds pursuant to commitments made by each Member, contributions, gifts, donations, grants and other receipts, including loans, as the Board of Trustees may determine. Any net balance of annual dues and additional funds provided for budgeted expenses and other receipts remaining unexpended at the end of any fiscal year shall be applied for your purposes in the following year. None of your Members shall obtain any special privilege from any patent which may be obtained for any invention owned or controlled by you or under which you have the right to grant licenses or sublicenses. To the extent permitted by law you shall grant non-exclusive royalty-free

and irrevocable licenses to applicants who are citizens of the U. S. or are corporations organized and doing business in the U. S., provided, however, that such applicants shall meet the requirements of the A. E. C. with respect to the use of such licenses. Such licenses may contain provisions for sublicensing and such other terms as may be needed to effectuate the free use of the patent rights in the public interest.

Exhibit 5, enclosed with your letter dated December 28, 1955, contains a list of your present Membership which you state are individuals who are generally representative of your proposed corporate Members. Exhibit 6, contains a list of your present Board of Trustees who are elected by the Members.

The events leading up to your participation in nuclear power development beginning in April 1951, prior to your incorporation, and subsequent thereto, are summarized in your letter dated April 25, 1957, and supporting Exhibits 1 to 8, inclusive.

You propose to design, build and operate at an estimated cost of \$30,511,000., exclusive of \$10,000,000. research and development work completed by Atomic Power Development Associates, Inc. (A. P. D. A.), an experimental fast neutron breeder reactor, which will be built on land leased from the Detroit Edison Company near Monroe, Michigan. The reactor will produce heat energy (steam) and plutonium. This project will be financed by the receipt of membership contributions aggregating \$25,511,000. and borrowings of \$15,000,000. You also will receive payments from Detroit Edison Company for its purchases of steam pro-

duced by such reactor. Such payments will be made at the equivalent cost basis of steam produced by Detroit Edison in its own coal fuel system and turbine generator plant, which plant will be constructed by Detroit Edison at its own expense at an estimated cost of \$14,000,000. You also will receive credits from the A. E. C. for plutonium produced in such reactor, pursuant to the A. E. Act of 1954, under which the A. E. C. has title to all special nuclear material.

You contend with respect to your ruling request (4) above that Membership dues and contributions received by you do not constitute gross income since you are required to expend them solely in pursuit of the development and demonstration of the practical and economic production

[6049]

and use of nuclear energy and, therefore, such dues and contributions are impressed with a trust when received and constitute a trust fund in your hands. In support of such contention you cite decisions in Broadcast Measurement Bureau, Inc. v. Com. 16 T. C. 988, Acq. C. B. 1951-2, page 2, and The Seven-Up Company v. Com., 14 T. C. 965, Acq. C. B. 1950-2, page 4.

In view of the foregoing on the basis of the information submitted it is ruled solely with respect to Membership payments received by you, that such payments do not constitute gross income under section 61 of the Code of 1954.

Pursuant to a power of attorney recorded in this office a copy of this letter has been furnished to Mr. Roswell

6049

Magill, c/o Cravath, Swaine & Moore, 15 Broad Street, New York 5, New York.

Very truly yours,

H. T. SWARTZ

Director, Tax Rulings Division

[6050]

U. S. TREASURY DEPARTMENT

WASHINGTON 25

Jul 19 1957

Office of
Commissioner of Internal Revenue

Address Reply to
Commissioner of Internal Revenue
Washington 25, D. C.
and Refer to
T:R:C
WMD

RECEIVED

JUL 22 1957

C. H. G. & E. CORP.

Central Hudson Gas and Electric
Corporation,
Poughkeepsie, New York.

Gentlemen:

This is in reply to a letter dated April 25, 1957, signed by your representative Mr. Roswell Magill, in which a ruling is requested that amounts paid or incurred by you to Power Reactor Development Company (PRDC) as a Member of such corporation are deductible by you under section 174(a) of the Internal Revenue Code of 1954.

Based upon the information submitted it is ruled that amounts paid or incurred by you to PRDC as a Member thereof are deductible under section 174(a) of the Code, provided you properly adopt the method provided by such section and the regulations promulgated thereunder.

Pursuant to a power of attorney recorded in this office a copy of this letter has been furnished to Mr. Roswell Magill, c/o Cravath, Swaine & Moore, 15 Broad St., New York 5, New York.

Very truly yours,

H. T. SWARTZ,

Director, Tax Rulings Division.

Revenue
CALCULATION OF PLUTONIUM REVENUE

**Exhibit XLI
 Sheet 3**

<u>YEAR</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>Reference Authority</u>
<u>Operating Data</u>											
Reactor Power Level, mw Heat	300	300	350	350	400	430	430	430	430	430	
Load Factor	0.40	0.45	0.70	0.70	0.75	0.75	0.70	0.80	0.80	0.80	
Reactor Output, mw yrs.	120	135	245	245	300	322	301	344	344	344	
Burn-up, Per cent	1.0	1.5	2.0	2.0	2.5	3.0	3.0	3.0	3.0	3.0	AFMA, J. Hanna
<u>Plutonium Production</u>											
Gross Production, kg. yr.	15.16	45.33	72.18	89.89	151.02	124.86	117.79	125.63	159.77	206.27	
Net Production, kg. yr. Deduct 2% loss	14.86	44.43	70.74	88.10	148.00	122.37	115.44	123.12	156.58	202.15	
<u>Plutonium Unit Price,</u> ¢ Per gm.	44.20	37.10	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	(AEC schedule of Plutonium (Guaranteed Fair Prices, (dated May 31, 1957, 22 Fed. (Reg. 3985)
<u>Plutonium Revenue, \$1000</u>	657	1648	2122	2643	4440	3671	3463	3694	4697	6065	
TOTAL										33,100	AFMA, J. Hanna

*Six Months Production at \$44.20 and 6 months at \$30.00/gr.

July 19, 1957

[6063]

Application Exhibit XLII
COMMONWEALTH ASSOCIATES INC.

209 E. Washington Ave.
Jackson, Michigan
STate 4-6111

July 19, 1957

ENRICO FERMI ATOMIC POWER PLANT
Revised Schedule of Plant Costs

Mr. R. W. Hartwell,
Power Reactor Development Company,
1911 First Street
Detroit 26 Michigan.

Dear Mr. Hartwell:

In accordance with conversations we have had recently, we are attaching a revised schedule of estimated plant cost expenditures by years which we have computed from a preliminary revision of the PRDC construction schedule. Our engineers have reviewed the delivery schedules and current construction progress and tentatively recommend a stretch-out of approximately eight months in the schedule. On this basis we have assumed that the reactor would go critical on September 1, 1960 instead of December 15, 1959 as previously planned. While we have not completed our revised construction schedule in detail, we believe that our review of the status of important components of the reactor indicates a stretch-out of from six to eight months. In our opinion a revision of the construction schedule indicating criticality on September 1, 1960 is conservative and the

resulting schedule would be realistic on the basis of progress to date and of presently anticipated component deliveries.

It is expected that the reactor vessel can be delivered to the job by January 15, 1958 and we have taken this into consideration in making this preliminary revision. We have also assumed that no erection work of major consequence will be carried out below the operating floor in the containment vessel during the component test operation to be conducted by ADPA. This assumption may be conservative and, if in fact such work can be carried on during the component test program, it may be possible to improve the schedule.

You will note that our estimated plant cost has increased \$450,000 from the \$32,400,000 which was presented in our December 31, 1956 estimate. This increase provides for 1961 tax payments and for interest during the longer construction and test period. In addition, we assume that overhead and administrative costs which we have never included in our construction estimate and which we understand have been estimated by your staff at \$1,816,000 through December 31, 1960 would also have to be increased to cover the additional time allocated to construction and testing.

Yours very truly,

B. S. MOULTON,
B. S. MOULTON,
Project Engineer.

BSM/hl

[6064]

PRDC-ENRICO FERMI ATOMIC POWER PLANT PROJECT

Total Estimated Plant Cost By Years
(Figures Are In Thousands of Dollars)

	1956	1957	1958	1959	1960	1961	Total
Site Improvements ..	\$153.7	\$ 246.3			\$ 20.0	\$ 18.9	\$ 438.9
Structures	167.0	1,800.0	1,700.0	\$ 663.2	600.0	400.0	5,030.2
Reactor Plant Equip.		1,000.0	2,000.0	1,800.0	1,000.0	694.7	6,494.7
Liquid Metal System		500.0	1,000.0	1,500.0	1,875.0	150.0	5,025.0
Other Reactor Plant Equip.		200.0	1,300.0	1,600.0	1,258.0	50.0	4,408.0
Initial Supplies			300.0	800.0	278.0		1,378.0
Miscellaneous			150.0	250.0	244.0	50.0	694.0
Subtotal	\$320.7	\$3,746.3	\$6,450.0	\$6,613.2	\$5,275.0	\$1,063.6	\$23,468.8
Construction Plant ..	\$179.5	\$ 450.0	\$ 650.0	\$ 675.0	\$ 575.0	\$ 447.5	\$ 2,977.0
Spare Parts					160.0		160.0
Preoperation Tests ..				25.0	325.0		350.0
Personnel Training ..				150.0	350.0		500.0
Initial Low Load Operation					200.0	350.0	550.0
Interest		150.0	450.0	600.0	600.0	300.0	2,100.0
Local Taxes		6.5	50.0	125.0	300.0	187.7	669.2
Engineering	56.0	250.0	325.0	200.0	50.0	19.0	900.0
Subtotal	\$556.2	\$4,602.8	\$7,925.0	\$8,388.2	\$7,835.0	\$2,367.8	\$31,675.0
Working Capital							1,175.0
Total Estimated Plant Cost							\$32,850.0

* * *

Total Estimated Plant Cost by Years Excluding Working Capital of \$1,175.0 and Allowance of \$3,000.0 for Equipment and Devices to be Furnished by Atomic Power Development Associates

	1956	1957	1958	1959	1960	1961	Total
Subtotal	\$556.2	\$3,902.8	\$6,325.0	\$7,688.2	\$7,835.0	\$2,367.8	\$28,675.0

[6065]

Application Exhibit XLIII

**POWER REACTOR DEVELOPMENT COMPANY
ENRICO FERMI ATOMIC POWER PLANT PROJECT**

**STATEMENT OF SOURCE AND APPLICATION OF CASH
DURING CONSTRUCTION PERIOD**

**PREPARED IN ACCORDANCE WITH
PRELIMINARY REVISED CONSTRUCTION SCHEDULE**

**Arthur Anderson & Co.
Detroit**

July 19, 1957

[6066]

**POWER REACTOR DEVELOPMENT COMPANY
ENRICO FERMI ATOMIC POWER PLANT PROJECT**

**STATEMENT OF SOURCE AND APPLICATION OF CASH
DURING CONSTRUCTION PERIOD**

**PREPARED IN ACCORDANCE WITH
PRELIMINARY REVISED CONSTRUCTION SCHEDULE**

At the request of the Company, we have prepared statements based upon data furnished by Company personnel as of July 19, 1957, which statements show the source and application of cash during the construction period. This construction period includes the year 1956 and extends through the preoperational testing ending August 31, 1961, in accordance with a preliminary revised construction

schedule prepared by Commonwealth Associates, Inc., architects and engineers for the project.

Schedule No. 1 is a statement of source and application of cash during the construction period. Cash sources are based upon the commitment contracts for the amount of \$23,540,000 in existence between the Company and its members, and upon the Loan Agreement between the Company and J. P. Morgan & Co., Incorporated, as agent for certain institutions.

Additional contributions to be made in 1961 by the utility member companies of Power Reactor Development Company in the total amount of \$3,908,000 are to be held as a reserve for possible increases in construction or developmental costs and are not reflected in this schedule.

[6067]

Cash applications are based upon data furnished by Commonwealth Associates, Inc., architects and engineers for the project, and by Company personnel. Commonwealth Associates, Inc., furnished the estimated annual plant costs. Company personnel furnished the estimated remaining annual cash applications such as direct research and development cost, administrative expense, interest expense, and local taxes.

The Company has received a ruling dated July 19, 1957, from the Internal Revenue Service that the contributions from members during the construction period are not taxable income for Federal income tax purposes.

[6068]
STATEMENT OF SOURCE AND APPLICATION OF CASH
DURING CONSTRUCTION PERIOD

EXHIBIT XLIII
SCHEDULE NO. 1

PREPARED IN ACCORDANCE WITH PRELIMINARY
REVISED CONSTRUCTION SCHEDULE

Particulars	Line No.	Y e a r					Eight Months Ending August 31, 1961	Total
		1956	1957	1958	1959	1960		
Source of cash-								
Contributions (see Notes 1 and 2)	1	\$2,051,400	\$ -	\$ 1,000,000	\$ 7,895,800	\$12,592,800	\$ -	\$23,540,000
Long-term loans	2	-	8,000,000	7,000,000	-	-	-	15,000,000
Total source of cash	3	\$2,051,400	\$8,000,000	\$ 8,000,000	\$ 7,895,800	\$12,592,800	\$ -	\$38,540,000
Application of cash-								
Plant expenditures (see Schedule No. 2)	4	\$ 806,200	\$4,146,300	\$ 6,125,000	\$ 7,313,200	\$ 7,285,000	\$ 2,400,100	\$28,075,800
Interest	5	-	150,000	450,000	600,000	600,000	300,000	2,100,000
Property taxes	6	-	6,500	50,000	125,000	300,000	187,700	669,200
Direct research and development cost	7	-	1,500,000	2,500,000	1,000,000	-	-	5,000,000
Total application of cash (see Note 3)	8	\$ 806,200	\$5,802,800	\$ 9,125,000	\$ 9,038,200	\$ 8,185,000	\$ 2,887,800	\$35,845,000
Net cash increase (decrease) during period	9	\$1,245,200	\$2,197,200	\$(1,125,000)	\$(1,142,400)	\$ 4,407,800	\$(2,887,800)	\$ 2,695,000
Cash balance - end of period	10	\$1,245,200	\$3,442,400	\$ 2,317,400	\$ 1,175,000	\$ 5,582,800	-\$ 2,695,000	

NOTES:

(1) A contribution in kind to the extent of \$1,000,000 is reflected in the contributions to be received in 1958 as the goods and services to be contributed will be required in that year under the construction schedule.

(2) Additional contributions to be made in 1961 by utility member companies of PRDC in the total amount of \$3,908,000 are to be held as a reserve for possible increases in construction or development costs and are not reflected in this statement.

(3) Total estimated project consists of-

Total application of cash by PRDC (see Line 8)	\$35,845,000
Working capital	1,175,000
Total PRDC cash requirement	\$37,020,000

Value to PRDC of research, development, test devices and equipment to be provided by Atomic Power Development Associates	7,000,000
Total estimated project	\$44,020,000

CALCULATION OF PLANT EXPENDITURES

PREPARED IN ACCORDANCE WITH PRELIMINARY

REVISED CONSTRUCTION SCHEDULE

<u>Particulars</u>	<u>Line No.</u>	<u>Y e a r</u>					<u>Eight Months Ending August 31, 1961</u>	<u>Total</u>
		<u>1 9 5 6</u>	<u>1 9 5 7</u>	<u>1 9 5 8</u>	<u>1 9 5 9</u>	<u>1 9 6 0</u>		
Total estimated plant cost per Commonwealth Associates, Inc.	1	\$550,200	\$3,902,800	\$1,375,000	\$7,083,200	\$7,835,000	\$2,367,800	\$28,073,000
Adjustments-								
Deduct- Interest during construction included in estimated plant cost	2		(150,000)	(450,000)	(100,000)	(600,000)	(300,000)	(2,100,000)
Deduct- Property taxes included in estimated plant cost	3		(5,000)	(50,000)	(10,000)	(300,000)	(187,000)	(669,200)
Add- Administrative expenses	4	250,000	200,000	300,000	100,000	350,000	520,000	2,170,000
Plant expenditures	5	\$800,200	\$4,000,000	\$1,175,000	\$7,183,200	\$7,885,000	\$2,400,800	\$28,073,200

[6070]

Application Exhibit XLIV

**POWER REACTOR DEVELOPMENT COMPANY
ENRICO FERMI ATOMIC POWER PLANT PROJECT
STATEMENT OF SOURCE AND APPLICATION OF CASH
DURING TEN YEAR OPERATING PERIOD**

**FOLLOWING COMPLETION OF CONSTRUCTION AND TESTING
IN ACCORDANCE WITH PRELIMINARY REVISED
CONSTRUCTION SCHEDULE**

**Arthur Anderson & Co.
Detroit**

July 19, 1957

[6071]

**POWER REACTOR DEVELOPMENT COMPANY
ENRICO FERMI ATOMIC POWER PLANT PROJECT
STATEMENT OF SOURCE AND APPLICATION OF CASH
DURING TEN YEAR OPERATING PERIOD**

**FOLLOWING COMPLETION OF CONSTRUCTION AND TESTING
IN ACCORDANCE WITH PRELIMINARY REVISED
CONSTRUCTION SCHEDULE**

At the request of the Company, we have prepared statements based upon data furnished by Company personnel as of July 19, 1957, which statements show the source and application of cash during a ten year period of operations beginning September 1, 1961, and following completion and testing of the reactor plant in accordance with a preliminary

revised construction schedule prepared by Commonwealth Associates, Inc., architects and engineers for the project.

Schedule No. 1 is a statement of source and application of cash during the ten year operating period. Cash sources and cash applications for the period are based upon data furnished by Company personnel. Cash balance at September 1, 1961, is a carry-forward from the statement of source and application of cash during the construction period.

Following the instructions of the Company, this statement reflects the receipts from member companies for repayment of the \$15,000,000 long-term loan as taxable income to the Company.

[6072]

In determining the Federal income tax liability, the cash sources and cash applications for the period of operations as furnished by Company personnel were adjusted to reflect depreciation expense.

The Company has received a ruling dated July 19, 1957, from the Internal Revenue Service that contributions during the construction period are not taxable income to the Company. In computing the depreciation expense, the tax basis of the plant for depreciation purposes was decreased in an amount equal to the contributions during the construction period. This adjustment represents a conservative tax accounting for money contributed to a corporation for plant construction.

The Company engineers furnished the estimated life of the plant and net salvage.

[6073]

STATEMENT OF SOURCE AND APPLICATION OF CASHDURING TEN YEAR OPERATING PERIODFOLLOWING COMPLETION OF CONSTRUCTION AND TESTINGIN ACCORDANCE WITH PRELIMINARY REVISED CONSTRUCTION SCHEDULE

<u>Particulars</u>	<u>Line No.</u>	<u>Twelve Month Period Ending August 31</u>							
		<u>1 9 6 2</u>	<u>1 9 6 3</u>	<u>1 9 6 4</u>	<u>1 9 6 5</u>	<u>1 9 6 6</u>	<u>1 9 6 7</u>	<u>1 9 6 8</u>	<u>1 9 6 9</u>
Year of operation		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Source of cash-									
Operating revenues-									
Steam sales	1	\$ 1,191,000	\$1,537,000	\$3,878,000	\$3,649,000	\$ 4,644,000	\$ 5,338,000	\$ 5,182,000	\$ 5,867,000
Sales of plutonium	2	622,000	1,333,000	2,122,000	2,643,000	4,440,000	3,671,000	3,463,000	3,694,000
Temporary loans (see Schedule No. 6)	3	1,165,000	2,515,000	336,000	479,000	-	-	-	-
Receipts from member companies for repayment of long-term loans	4	-	-	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
	5	\$ 2,978,000	\$5,385,000	\$8,336,000	\$8,771,000	\$11,084,000	\$11,009,000	\$10,645,000	\$11,561,000
Application of cash-									
Operating expenses-									
Production costs	6	\$ 1,473,000	\$1,536,000	\$1,802,000	\$1,832,000	\$ 1,977,000	\$ 2,064,000	\$ 2,053,000	\$ 2,180,000
Core processing costs	7	527,000	697,000	715,000	821,000	714,000	769,000	713,000	754,000
Blanket processing costs	8	135,000	295,000	414,000	474,000	1,011,000	604,000	572,000	622,000
Additional fuel cycle costs	9	844,000	1,247,000	1,748,000	2,053,000	2,963,000	3,436,000	3,112,000	3,298,000
Property taxes	10	690,000	690,000	690,000	690,000	690,000	690,000	690,000	690,000
Insurance	11	149,000	149,000	149,000	149,000	149,000	149,000	149,000	149,000
Interest on long-term loans (see Schedule No. 5)	12	652,000	653,000	630,000	544,000	457,000	370,000	282,000	196,000
Interest on temporary loans (see Schedule No. 6)	13	28,000	118,000	188,000	208,000	197,000	155,000	113,000	64,000
Payment of principal on long-term loans	14	-	-	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Payment of principal on temporary loans (see Schedule No. 6)	15	-	-	-	-	926,000	772,000	961,000	1,042,000
Federal income tax payments (see Schedule No. 2)	16	-	-	-	-	-	-	-	566,000
	17	\$ 4,498,000	\$5,385,000	\$8,336,000	\$8,771,000	\$11,084,000	\$11,009,000	\$10,645,000	\$11,561,000
Net cash increase (decrease) during year	18	\$ (1,520,000)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Cash balance - September 1, 1961	19	\$ 2,695,000							
Cash balance - end of period	20	\$ 1,175,000	\$1,175,000	\$1,175,000	\$1,175,000	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000

EXHIBIT XLIV

SCHEDULE NO. 1

<u>1970</u>	<u>1971</u>	<u>Total</u>
<u>9</u>	<u>10</u>	
\$ 6,015,000	\$ 6,165,000	\$43,466,000
4,697,000	6,065,000	32,750,000
-	-	4,495,000
3,000,000	-	15,000,000
<u>\$13,712,000</u>	<u>\$12,230,000</u>	<u>\$95,711,000</u>
\$ 2,218,000	\$ 2,258,000	\$19,393,000
820,000	810,000	7,340,000
729,000	1,132,000	5,988,000
3,705,000	3,765,000	26,171,000
690,000	690,000	6,900,000
149,000	149,000	1,490,000
99,000	-	3,883,000
24,000	1,000	1,096,000
3,000,000	-	15,000,000
613,000	181,000	4,495,000
1,665,000	2,234,000	4,465,000
<u>\$13,712,000</u>	<u>\$11,220,000</u>	<u>\$96,221,000</u>
\$ -	\$ 1,010,000	\$ (510,000)
<u>\$ 1,175,000</u>	<u>\$ 2,185,000</u>	<u>\$ 2,185,000</u>

[6074]

CALCULATION OF FEDERAL INCOME TAX PAYMENTS

DURING TEN YEAR OPERATING PERIOD

FOLLOWING COMPLETION OF CONSTRUCTION AND TESTING

IN ACCORDANCE WITH PRELIMINARY REVISED CONSTRUCTION SCHEDULE

Particulars	Line No.	Twelve Month Period Ending August 31 st							
		1962	1963	1964	1965	1966	1967	1968	1969
Year of operation		1	2	3	4	5	6	7	8
Revenues-									
Steam sales	1	\$ 1,191,000	\$ 1,537,000	\$ 3,878,000	\$ 3,649,000	\$ 4,644,000	\$ 5,338,000	\$ 5,182,000	\$ 5,867,000
Sales of plutonium	2	622,000	1,333,000	2,122,000	2,643,000	4,440,000	3,671,000	3,463,000	3,694,000
Receipts from member companies for repayment of long-term loans	3	-	-	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Total revenues	4	\$ 1,813,000	\$ 2,870,000	\$ 8,000,000	\$ 8,292,000	\$ 11,084,000	\$ 11,009,000	\$ 10,645,000	\$ 11,561,000
Expenses-									
Production costs	5	\$ 1,473,000	\$ 1,536,000	\$ 1,802,000	\$ 1,832,000	\$ 1,977,000	\$ 2,064,000	\$ 2,053,000	\$ 2,180,000
Core processing costs	6	527,000	697,000	715,000	821,000	714,000	769,000	713,000	754,000
Blanket processing costs	7	135,000	295,000	414,000	474,000	1,011,000	604,000	572,000	622,000
Additional fuel cycle costs	8	844,000	1,247,000	1,748,000	2,053,000	2,963,000	3,436,000	3,112,000	3,298,000
Property taxes	9	690,000	690,000	690,000	690,000	690,000	690,000	690,000	690,000
Insurance	10	149,000	149,000	149,000	149,000	149,000	149,000	149,000	149,000
Interest on long-term loans (see Schedule No. 5)	11	652,000	653,000	630,000	544,000	457,000	370,000	282,000	196,000
Interest on temporary loans (see Schedule No. 6)	12	28,000	118,000	188,000	208,000	197,000	155,000	113,000	64,000
Depreciation (see Schedule No. 4)	13	730,000	731,000	730,000	731,000	730,000	731,000	730,000	731,000
Amortization of direct research and development costs	14	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Total expenses	15	\$ 5,728,000	\$ 6,616,000	\$ 7,566,000	\$ 8,002,000	\$ 9,388,000	\$ 9,468,000	\$ 8,914,000	\$ 9,184,000
Net taxable income (loss)	16	\$ (3,915,000)	\$ (3,746,000)	\$ 434,000	\$ 290,000	\$ 1,696,000	\$ 1,541,000	\$ 1,731,000	\$ 2,377,000
Federal income tax liability (see Schedule No. 3)	17	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,231,000
Federal income tax payments (see Schedule No. 3)	18	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 566,000

6074

EXHIBIT XLIV

SCHEDULE NO. 2

<u>1 9 7 0</u>	<u>1 9 7 1</u>	<u>Total</u>
<u>9</u>	<u>10</u>	
\$ 6,015,000	\$ 6,165,000	\$43,466,000
4,697,000	6,065,000	32,750,000
3,000,000	-	15,000,000
<u>\$13,712,000</u>	<u>\$12,230,000</u>	<u>\$91,216,000</u>
\$ 2,218,000	\$ 2,258,000	\$19,393,000
820,000	810,000	7,340,000
729,000	1,132,000	5,988,000
3,705,000	3,765,000	26,171,000
690,000	690,000	6,900,000
149,000	149,000	1,490,000
99,000	-	3,883,000
24,000	1,000	1,096,000
730,000	731,000	7,305,000
500,000	500,000	5,000,000
<u>\$ 9,664,000</u>	<u>\$10,036,000</u>	<u>\$84,566,000</u>
\$ 4,048,000	\$ 2,194,000	\$ 6,650,000
2,099,000	1,135,000	4,465,000
1,665,000	2,234,000	4,465,000

[6075]

SUPPORTING CALCULATIONS OF FEDERAL INCOME TAXES

DURING TEN YEAR OPERATING PERIOD

FOLLOWING COMPLETION OF CONSTRUCTION AND TESTING
IN ACCORDANCE WITH PRELIMINARY REVISED CONSTRUCTION SCHEDULE

Particulars	Line No.	Twelve Month Period Ending August 31							
		1962	1963	1964	1965	1966	1967	1968	1
Year of operation		1	2	3	4	5	6	7	
Net taxable income (loss) (see Line 16, Schedule No. 2)	1	\$(3,915,000)	\$(3,746,000)	\$434,000	\$290,000	\$1,696,000	\$1,541,000	\$1,731,000	\$2
Loss carry-forward-									
1962 - 2 years to 1964	2	434,000		(434,000)					
3 years to 1965	3	290,000			(290,000)				
4 years to 1966	4	1,696,000				(1,696,000)			
5 years to 1967	5	1,495,000					(1,495,000)		
1963 - 4 years to 1967	6		46,000				(46,000)		
5 years to 1968	7		1,731,000					(1,731,000)	
Net taxable income (loss) after carry-forward	8	\$ -	\$(1,969,000)	\$ -	\$ -	\$ -	\$ -	\$ -	\$2
Computation of tax liability-									
Net taxable income subject to tax in current year	9								\$2
Tax rate	10								
	11								\$1
Less- Statutory exemption	12								
Federal income tax liability (see Line 17, Schedule No. 2)	13								\$1
Federal income tax payments-									
Payable in current year - 50% of excess over \$100,000	14								\$
Payable in subsequent year - balance	15								
Entire tax liability for the twelve months ending August 31, 1971, has been considered payable in that year	16								
Federal income tax payments (see Line 18, Schedule No. 2)	17								\$

EXHIBIT XLIV
SCHEDULE NO. 3

Period Ending August 31

<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
\$1,541,000	\$1,731,000	\$2,377,000	\$4,048,000	\$2,194,000

(1,495,000)

(46,000)

(1,731,000)

\$ -	\$ -	\$2,377,000	\$4,048,000	\$2,194,000
		\$2,377,000	\$4,048,000	\$2,194,000
		52%	52%	52%
		\$1,236,500	\$2,104,500	\$1,140,500
		5,500	5,500	5,500
		\$1,231,000	\$2,099,000	\$1,135,000
		\$ 566,000	\$1,000,000	\$
			665,000	1,099,000
				1,135,000
		\$ 566,000	\$1,665,000	\$2,234,000

6076

[b76]

Schedule No. 4

CALCULATION OF ANNUAL DEPRECIATION
DURING TEN YEAR OPERATING PERIODFOLLOWING COMPLETION OF CONSTRUCTION AND TESTING
IN ACCORDANCE WITH PRELIMINARY REVISED
CONSTRUCTION SCHEDULE.

Plant expenditures	\$28,675,000
Add—Administrative expense	2,170,000
	<hr/>
Total plant	\$30,845,000
Less—Contributions during construction period	23,540,000
	<hr/>
Net depreciable plant— adjusted basis	\$ 7,305,000
	<hr/>
Annual depreciation—based on ten year life and assuming that salvage will be equal to cost of removal	\$ 730,500
	<hr/>

[6077]

Schedule No. 5

CALCULATION OF INTEREST ON LONG-TERM BANK LOANS DURING TEN YEAR OPERATING PERIOD

FOLLOWING COMPLETION OF CONSTRUCTION AND TESTING IN ACCORDANCE
WITH PRELIMINARY REVISED CONSTRUCTION SCHEDULE

Twelve Month Period Ending August 31	Year of Operation	Date of Payment	Loans Outstanding Amount	Number of Months	Amount	Total
1962	1	12-31 6-30	\$15,000,000 15,000,000	6 6	\$326,000 326,000	\$652,000
1963	2	12-31 6-30	15,000,000 15,000,000	6 6	\$326,500 326,500	\$653,000
1964	3	12-31 6-30	15,000,000 14,000,000	6 6	\$326,000 304,000	\$630,000
1965	4	12-31 6-30	13,000,000 12,000,000	6 6	\$282,500 261,500	\$544,000
1966	5	12-31 6-30	11,000,000 10,000,000	6 6	\$239,000 218,000	\$457,000
1967	6	12-31 6-30	9,000,000 8,000,000	6 6	\$196,000 174,000	\$370,000
1968	7	12-31 6-30	7,000,000 6,000,000	6 6	\$152,000 130,000	\$282,000
1969	8	12-31 6-30	5,000,000 4,000,000	6 6	\$108,500 87,500	\$196,000
1970	9	12-31 6-30	3,000,000 1,500,000	6 6	\$ 66,000 33,000	\$ 99,000
1971	10					\$ —

(6079)

APPLICATION EXHIBIT XLV

POWER REACTOR DEVELOPMENT COMPANY

COMPARISON OF CONSTRUCTION ESTIMATES AND COMMITMENTS
(Direct Costs Only)Exhibit XLV
Sheet 1

	(1) CAI Est. (1)	(2) Order or Commitment	(3) % of Est. Cost	(4) Expended to 6-31-57	Commitment		Contingencies		(9) (Col. 1+7+8) Net Balance, Inc. Contingency (Overrun)
					(5) Below Est.	(6) Above Est.	(7) Provided	(8) Remaining (Overrun)	
<u>Structures & Improvements</u>									
A-1 Dredge & Grade Fill	\$ 135,000	\$ 152,500	113	\$ 152,500	\$ -	\$ 17,500	\$ 13,500	\$ (4,000)	\$ (4,000)
A-3 Yard Lighting	10,000	6,370	64	6,370	3,630	-	1,500	1,500	5,130
<u>Reactor Plant Structures</u>									
B-1 Excavation, Grouting Foundations, Etc. Dewatering Excavation	269,850	238,646	96	226,378	11,204	-	25,000	25,000	36,204
B-2 Containment Vessel	735,250(2)	800,000(2)	108	185,600	-	60,000	73,525	8,775	(60,000)
B-3 Internal Structure	495,900	375,000	76	-	119,500	64,750	49,450	49,450	8,775
<u>Reactor Plant Equipment</u>									
C-7 Overhead Crane	200,000(2)	220,000	110	-	-	20,000	30,000	10,000	10,000
<u>Liquid Metal System</u>									
D-3 Intermediate Heat Exchanger	925,000	1,700,000	183	-	-	775,000	877,500	(197,500)	(197,500)
D-5 2 Loops Primary Sodium Piping	150,000(2)	220,500(2)	147	-	-	70,500	45,000	(25,500)	(25,500)
D-7 Secondary Containment, Primary Sodium System	70,000(2)	220,000(2)	300	-	-	150,000	21,000	(129,000)	(129,000)
D-9 Secondary Containment Secondary Sodium System	60,000(2)	-	-	-	-	-	18,000	18,000	78,000
<u>Liquid Metal Storage</u>									
F-1 Storage Tanks	100,000	48,700	40	-	51,300	-	30,000	30,000	84,300
<u>Other Reactor Plant Equip.</u>									
G-5 Instrumentation	128,000	128,000	100	-	-	-	38,400	38,400	38,400
	<u>\$3,257,600</u>	<u>\$4,169,796</u>					<u>\$622,875</u>	<u>38,400</u>	<u>\$(289,321)</u>

- (1) - Portion of Estimate Covered by Commitment
(2) - Structured Cost

RECAP:-
CAI Estimates \$3,257,600
Contingency Allowances 622,875
Over Run 289,321 7.5 %
Commitments \$4,169,796

[6079]

6079

[6078]

CALCULATION OF TEMPORARY LOANS AND INTEREST

DURING TEN YEAR OPERATING PERIOD

FOLLOWING COMPLETION OF CONSTRUCTION AND TESTING

IN ACCORDANCE WITH PRELIMINARY REVISED CONSTRUCTION SCHEDULE

Particulars	Line No.	Twelve Month Period Ending August 31						
		1962	1963	1964	1965	1966	1967	1968
Year of operation		1	2	3	4	5	6	7
Cash balance - beginning of period	1	\$ 2,695,000	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000
Net cash increase (decrease) during period before temporary loans-								
Sources of cash - see Line 5, Schedule No. 1	2	\$ 2,978,000	\$ 5,385,000	\$ 8,336,000	\$ 8,771,000	\$ 11,084,000	\$ 11,009,000	\$ 10,645,000
Less- Temporary loans - see Line 3, Schedule No. 1	3	1,165,000	2,515,000	336,000	479,000	-	-	-
	4	\$ 1,813,000	\$ 2,870,000	\$ 8,000,000	\$ 8,292,000	\$ 11,084,000	\$ 11,009,000	\$ 10,645,000
Application of cash - see Line 17, Schedule No. 1	5	\$ 4,498,000	\$ 5,385,000	\$ 8,336,000	\$ 8,771,000	\$ 11,084,000	\$ 11,009,000	\$ 10,645,000
Less- Interest on temporary loans, see Line 13, Schedule No. 1	6	28,000	118,000	188,000	208,000	197,000	155,000	113,000
Payment of principal on temporary loans, see Line 15, Schedule No. 1	7	-	-	-	-	926,000	772,000	961,000
	8	\$ 4,470,000	\$ 5,267,000	\$ 8,148,000	\$ 8,563,000	\$ 9,961,000	\$ 10,082,000	\$ 9,571,000
Net cash increase (decrease) from operations (Line 4, less Line 8)	9	\$ (2,657,000)	\$ (2,397,000)	\$ (148,000)	\$ (271,000)	\$ 1,123,000	\$ 927,000	\$ 1,074,000
Cash requirement (excess) before interest payment and after providing working capital of \$1,175,000	10	\$ 1,137,000	\$ 2,397,000	\$ 148,000	\$ 271,000	\$ (1,123,000)	\$ (927,000)	\$ (1,074,000)
Interest on temporary loans-								
Temporary loans - beginning of period	11	\$ -	\$ 1,165,000	\$ 3,680,000	\$ 4,016,000	\$ 4,495,000	\$ 3,569,000	\$ 2,797,000
Average amount of current period cash requirement (excess) outstanding during period	12	569,000	1,198,000	74,000	136,000	(562,000)	(464,000)	(537,000)
	13	\$ 569,000	\$ 2,363,000	\$ 3,754,000	\$ 4,152,000	\$ 3,933,000	\$ 3,105,000	\$ 2,260,000
Interest rate	14	5%	5%	5%	5%	5%	5%	5%
Interest on temporary loans, see Line 13, Schedule No. 1	15	\$ 28,000	\$ 118,000	\$ 188,000	\$ 208,000	\$ 197,000	\$ 155,000	\$ 113,000
Required temporary loan (repayment) - current period, see Lines 3 and 15, Schedule No. 1	16	\$ 1,165,000	\$ 2,515,000	\$ 336,000	\$ 479,000	\$ (926,000)	\$ (772,000)	\$ (961,000)
Temporary loans - balance at end of current period	17	\$ 1,165,000	\$ 3,680,000	\$ 4,016,000	\$ 4,495,000	\$ 3,569,000	\$ 2,797,000	\$ 1,836,000
Cash balance - end of period (Lines 1 plus 9 less 15 plus 16) - see Line 20, Schedule No. 1	18	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000

EXHIBIT XLIV

SCHEDULE NO. 6

Sat 31

<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
\$ 1,175,000	\$ 1,175,000	\$ 1,175,000	\$ 1,175,000
\$10,645,000	\$11,561,000	\$13,712,000	\$12,230,000
\$10,645,000	\$11,561,000	\$13,712,000	\$12,230,000
\$10,645,000	\$11,561,000	\$13,712,000	\$11,220,000
113,000	64,000	24,000	1,000
961,000	1,042,000	613,000	181,000
\$ 9,571,000	\$10,455,000	\$13,075,000	\$11,038,000
\$ 1,074,000	\$ 1,106,000	\$ 637,000	\$ 1,192,000
)(\$ (1,074,000)	)( \$ (1,106,000)	)( \$ (637,000)	)( \$ (1,192,000)
\$ 2,797,000	\$ 1,836,000	\$ 794,000	\$ 181,000
)((537,000)	)( (553,000)	)( (319,000)	)( (154,000)
\$ 2,260,000	\$ 1,283,000	\$ 475,000	\$ 27,000
5%	5%	5%	5%
\$ 113,000	\$ 64,000	\$ 24,000	\$ 1,000
)(\$ (961,000)	)( \$ (1,042,000)	)( \$ (613,000)	)( \$ (181,000)
\$ 1,836,000	\$ 794,000	\$ 181,000	\$ -
\$ 1,175,000	\$ 1,175,000	\$ 1,175,000	\$ 2,185,000

[6080]

STRUCTURES AND IMPROVEMENTS

Item A-1 Dredge and Grade Fill

Work has been completed by the Charles J. Rogers Company. This required the removal of about 150,000 cu. yds. of muck and the placement of 350,000 cu. yds. of clay. Cost was shared with Detroit Edison on a 50-50 basis under provisions of Service Agreement (Exhibit XXVI). Cost shown represents PRDC share of total costs.

Item A-8 Yard Lighting

Work has been completed by Electric Machinery and Maintenance Company. Cost was shared with Detroit Edison on a 50-50 basis under provisions of Service Agreement (Exhibit XXVI). Cost shown represents PRDC share of total cost.

REACTOR PLANT STRUCTURES

Item B-1 Excavation, Grouting, Foundations, etc.

Pre-grouting work has been completed by Raymond Concrete Pile Co. Excavation work has been completed by Charles J. Rogers Company. Concrete foundation required for erection of the containment vessel has been completed by Gratton Construction Co. Back fill and waterproofing also was performed by Gratton. Additional external concrete foundation work must be done after the containment vessel is tested. It is estimated that about 53 per cent of work covered by this item is complete.

Item—Dewatering Excavation

Water which seeps into the excavated foundation hole and then around the concrete which is in place must be pumped out. This item was not included specifically in the estimate. Pumping is being done by

[6081]

United Engineers & Constructors' field force, on work orders issued by PRDC.

Item B-2 Containment Vessel

Erection of the containment vessel under contract of December 24, 1956 between PRDC and Chicago Bridge & Iron Co. has progressed to the point where essentially all of the extras are settled (including price for two air locks at total of \$43,800). Chicago Bridge & Iron is erecting the vessel and will complete the work by September 1, 1957. Insulation bids are in but no award has been made. Total order amount of \$800,000 includes allowance for escalation in accordance with CB&I contract, and also includes amounts bid on insulation.

B-3 Internal Structure

An award for steel plate shielding was made to the R. C. Mahon Co. Structural Steel was purchased from Ingalls Iron Works. The material covered by these two orders, placed on a firm price basis, accounts for 59 per cent of the material listed under this item in the construction estimate.

REACTOR PLANT EQUIPMENT

Item C-7 Overhead Crane

The crane has been purchased complete from the Whiting Corporation under contract of December 19, 1956. Erection will be done by United Engineers & Constructors, Inc.

LIQUID METAL SYSTEM

D-3 Intermediate Heat Exchangers

On June 4, 1957 Alco Products, Inc. was awarded a contract for the three intermediate heat exchangers. These units will be installed by United Engineers & Constructors, Inc.

[6082]

D-5 Two Loops Primary Sodium Piping

Fabrication and erection of the two loops of primary sodium piping will be done by the Grinnell Company under an award on competitive bids of June 21, 1957. Since APDA will provide the other loop, the portion of the item borne by PRDC is about 67 per cent of the total listed. Fabrication of the piping is on a fixed price basis at \$126,000 while erection is to be done on a unit price basis. Commonwealth Associates have estimated the cost of erection at \$94,500 based on the erection contract terms.

D-7 Secondary Containment—Primary Sodium System

Design, fabrication and erection of the secondary containment piping is being done under the award to

Grinnell Company, dated June 21, 1957. Commonwealth Associates has estimated over-all cost on the basis of this contract.

E-9 Secondary Containment—Secondary Sodium System

This item, which is included in the cost estimate, has now been eliminated from the design since the secondary system is non-radioactive and will, to a large extent, be installed in a tunnel.

LIQUID METAL STORAGE

F-1 Storage Tanks

An award based on competitive bids was made on June 25, 1957 to Philadelphia Coppersmithing Company for the three large sodium storage tanks which represent 67 per cent of the material included in this item.

OTHER REACTOR PLANT EQUIPMENT

G-6 Instrumentation

Non-nuclear instrumentation for the primary sodium system and the sodium storage facility has been purchased from Leeds and Northrup Company. It is estimated that this instrumentation represents about 14 per cent of the material listed.

[6273]

Application Exhibit XXI-A**(SUPPLEMENT TO APDA-PRDC AGREEMENT)**

COPY

TELEPHONE WOODWARD 2-9510

**ATOMIC POWER DEVELOPMENT ASSOCIATES,
INC.**1911 FIRST STREET
Detroit 26, Michigan

March 28, 1957

Mr. R. George Rinecliffe
Executive Vice President
Power Reactor Development Company
c/o The Philadelphia Electric Company
1000 Chestnut Street
Philadelphia 7, Pa.

Dear Sir:

APDA hereby offers to enter into an agreement with Power Reactor Development Company, supplemental to the agreement between them, dated as of December 14, 1956, as follows:

"Referring to the provisions of Article III of the agreement between the parties entered into as of December 14, 1956, looking toward further agreement, APDA hereby makes an unconditional commitment to supply to PRDC not less than \$7,000,000 worth of services and equipment provided for by said agreement (it being contemplated that this will be done by the

end of 1959) and PRDC agrees to go forward with construction of the reactor plant and agrees to use its best efforts to complete the construction and to operate the reactor plant."

If this offer is acceptable to PRDC, will you please so indicate by signing the enclosed copy of this letter and returning it to me at your earliest convenience.

Very truly yours,

JOHN R. COFFRAN

Title *Vice President*

ATOMIC POWER DEVELOPMENT ASSOCIATES, INC.

Accepted:

Power Reactor Development Company

By Ernest R. Acker

Vice President

Dated: March 28, 1957

[6274]

Application Exhibit XXII-A

GUARANTY AGREEMENT

Guaranty Agreement dated March 30, 1957 between CENTRAL HUDSON GAS & ELECTRIC CORPORATION, THE CINCINNATI GAS & ELECTRIC COMPANY, COLUMBUS AND SOUTHERN OHIO ELECTRIC COMPANY, CONSUMERS POWER COMPANY, DELAWARE POWER & LIGHT COMPANY, THE DETROIT EDISON COMPANY, IOWA-ILLINOIS GAS AND

ELECTRIC COMPANY, LONG ISLAND LIGHTING COMPANY, PHILADELPHIA ELECTRIC COMPANY, POTOMAC ELECTRIC POWER COMPANY, ROCHESTER GAS AND ELECTRIC CORPORATION, THE SOUTHERN COMPANY, WISCONSIN ELECTRIC POWER COMPANY, each acting severally and not jointly and herein called the "Guarantors"; J. P. MORGAN & CO. INCORPORATED, BANKERS TRUST COMPANY, THE CHASE MANHATTAN BANK, THE FIRST NATIONAL CITY BANK OF NEW YORK, CITY BANK FARMERS TRUST COMPANY, each acting severally and not jointly as trustee of various pension trusts, and BANKERS TRUST COMPANY as Trustee under agreement with American Brake Shoe Company dated May 17, 1940, herein called the "Banks"; J. P. MORGAN & CO. INCORPORATED, as Agent for all the Banks, herein called the "Agent"; and POWER REACTOR DEVELOPMENT COMPANY, herein called the "Company".

WHEREAS, the Company has executed and delivered to the Banks and the Agent a Loan Agreement dated October 30, 1956, in the form of Exhibit A hereto, herein called the "Loan Agreement", and proposes to borrow thereunder \$15,000,000 to be evidenced by its promissory notes (being in the form set forth in Exhibit A and herein called the "Notes") maturing July 1, 1970 and bearing interest at 4.35% per annum; and

WHEREAS, each of the Guarantors is a member or a parent of a member of the Company or a contributor to the Company and each of the Guarantors is interested in furthering the work of the Company; and

WHEREAS, in order to induce each of the Banks and the Agent to execute said Loan Agreement and to induce the Banks to make the loans therein provided for, each of the Guarantors is willing to guarantee, severally and not jointly, the payment when due of a percentage of the principal of and interest on the Notes as hereinafter provided; and

WHEREAS, due corporate proceedings have been taken by each Guarantor and all necessary authorizations or approvals of governmental administrative agencies or other regulatory bodies have been obtained with respect to the execution on its behalf of this agreement and its unconditional several guaranty herein provided for;

The Guarantors severally covenant and agree as follows:

FIRST: Each Guarantor hereby severally agrees with the Banks and the Agent to guarantee and does hereby unconditionally guarantee, the due and punctual payment of the percentage set opposite its name below of the principal of and interest on each and every one of the Notes and of the indebtedness represented thereby, as and when the same shall respectively become due and payable, whether at maturity or by declaration or otherwise, pursuant to the provisions of the Notes and of the Loan Agreement, and in case the Company shall fail to pay the principal of or interest on any of the

[6275]

Notes and of the indebtedness represented thereby, as and when the same shall respectively become due and payable, whether at maturity or by declaration or otherwise, pursuant to the provisions of the Notes and the Loan Agree-

ment, each Guarantor severally covenants and agrees duly and punctually to pay, in the manner provided in Section 2.8 of the Loan Agreement, the percentage of the same set opposite its name below:

<i>Name of Guarantor</i>	<i>Percentage Guaranteed</i>
Central Hudson Gas & Electric Corporation . . . . .	.80
The Cincinnati Gas & Electric Company	1.00
Columbus and Southern Ohio Electric Company	1.00
Consumers Power Company	10.00
Delaware Power & Light Company	1.20
The Detroit Edison Company	58.84
Iowa-Illinois Gas and Electric Company . . . . .	.48
Long Island Lighting Company	2.48
Philadelphia Electric Company	10.00
Potomac Electric Power Company	3.20
Rochester Gas and Electric Corporation	1.80
The Southern Company	8.00
Wisconsin Electric Power Company	1.20

Each Guarantor agrees that every payment made by it on account of principal of or interest on the Notes pursuant to its guaranty herein shall constitute a contribution by it to the Company to aid it in its scientific research and development and otherwise to further the work of the Company and in no event shall be deemed an advance or loan to the Company which is subject to repayment or which creates a claim of any kind against the Company.

SECOND: Each Guarantor hereby authorizes and directs the Company, in the name and on behalf of such Guarantor, to cause to be endorsed on the back of each Note executed and delivered by it a legend in the form set forth in Annex B to the Loan Agreement.

THIRD: Each Guarantor assents to the terms, covenants and conditions of the Notes and of the Loan Agreement and irrevocably waives presentation, demand or protest of any of the Notes and any and all notice of any such presentation, demand or protest. The obligation of each Guarantor hereunder or under its guaranty of a percentage of the principal of and interest on each of the Notes shall not be affected by the recovery of any judgment against the Company or any successor corporation, or by the levy of execution under any such judgment, or by any action or proceeding taken by the Agent or by the holder or holders of any of the Notes, either under the Notes or under the Loan Agreement, for the enforcement thereof or in the exercise of any right or power given or conferred thereby, or by any delay, failure, or omission upon the part of the Agent to enforce any of the rights or powers given or conferred by the Loan Agreement or this agreement, or by any delay, failure or omission on the part of any holder or holders of the Notes to enforce any right of such holder or holders against the Company or any successor corporation, or by any action of the Agent, or by any holder or holders of said Notes in granting indulgence to the Company or to any successor corporation or in granting any extension of time of payment, or in waiving or acquiescing in any default upon the part of the Company or any successor corporation under the Notes,

[6276].

or under the Loan Agreement, or by any breach, alteration, change or enforcement of any of the terms and provisions of the Loan Agreement or otherwise in respect thereof or

by any other act or delay or failure to act or by any other thing which may or might in any manner or to any extent vary the risk of any Guarantor under this agreement or under the guaranty of its percentage of the principal of and interest on said Notes, in accordance herewith; it being the purpose and intent of the parties hereto that the said several guaranties and the several obligations of the Guarantors hereunder shall be absolute and unconditional under any and all circumstances, and shall not be discharged except by payment as herein provided, and then only to the extent of such payment or payments.

FOURTH: Each Guarantor agrees that its right to payment of principal of and interest on any indebtedness that may hereafter exist from the Company to them is hereby expressly subordinated to the prior payment of the Notes and any other guaranteed indebtedness hereafter incurred by the Company as permitted by clause (b) of Section 4.3 of the Loan Agreement (the Notes and any such other guaranteed indebtedness being herein called "Guaranteed Indebtedness") as follows:

Upon any distribution of assets of the Company upon any dissolution, winding up, liquidation or reorganization of the Company, whether in bankruptcy, insolvency or receivership proceedings or upon an assignment for the benefit of creditors or any other marshalling of the assets and liabilities of the Company or otherwise,

(a) the holders of Guaranteed Indebtedness shall first be entitled to receive payment in full of the principal thereof and the interest due thereon before the Guarantors or other members of the Company (herein-

after collectively called the "members of the Company") are entitled to receive any payment upon the principal of or interest on any indebtedness from the Company to them; and

(b) any payment or distribution of assets of the Company of any kind or character, whether in cash, property or securities to which the members of the Company would be entitled except for these provisions shall be paid by the trustee or agent or other person making such payment or distribution (or by the members of the Company if received by them) direct to the holders of Guaranteed Indebtedness or their representative or representatives ratably according to the aggregate amounts remaining unpaid on account of the principal of and interest on Guaranteed Indebtedness held or represented by each, to the extent necessary to make payment in full of all Guaranteed Indebtedness remaining unpaid, after giving effect to any concurrent payment or distribution to the holders of Guaranteed Indebtedness.

Nothing contained herein is intended to or shall impair, as between the Company, its creditors other than the holders of Guaranteed Indebtedness and the members of the Company the obligation of the Company, which is unconditional and absolute, to pay to such members the principal of and interest on any indebtedness from the Company to them as and when the same shall become due and payable in accordance with its terms, or to affect the relative rights of the members and creditors of the Company other than the holders of Guaranteed Indebtedness, nor shall anything herein prevent any member from exercising all

remedies otherwise permitted by applicable law upon default in the payment of any indebtedness of the Company to it, subject to the rights, if any, under these provisions of the holders of Guaranteed Indebtedness in respect of cash, property or securities of the Company received upon the exercise of any such remedy.

FIFTH: Paragraphs First to Fourth of this agreement are made by each Guarantor for the benefit of each of the Banks, the Agent and the several holders from time to time of

[6277]

the Notes and of any other Guaranteed Indebtedness of the Company, and may be enforced directly by the holders of the Notes and such other Guaranteed Indebtedness or by any of them, from time to time, as often as occasion may arise, or by the Agent for the benefit of the holders of the Notes. The Agent, however, shall not be under any obligation to take any action for the enforcement of this agreement or of the guaranty of any Guarantor hereunder, unless requested to take such action by a writing signed by or on behalf of the holders of not less than 25% in principal amount of the Notes then outstanding and tendered reasonable indemnity against the expenses and liabilities which it may incur in connection with or by reason of such action.

SIXTH: The Agent shall not be responsible for the recitals herein. The Agent shall not be accountable in respect of the form, validity or enforceability of this agreement, or of any of the provisions hereof, nor of the several

guaranties of the Guarantors hereunder, and it makes no representation with respect thereto. All rights of action under this agreement or under the said guaranties may be enforced by the Agent without the possession of any of the Notes, or the production thereof on the trial or other proceedings relative thereto.

SEVENTH: It is an express condition of each of the several guaranties provided for in this agreement that no recourse whatsoever shall be had under said guaranty against any stockholder, officer, director or employee as such of any Guarantor, or of any successor corporation, either at law or in equity, and whether by the enforcement of any assessment or penalty or by virtue of any statute, constitution or rule of law, or otherwise. All such rights and claims are expressly waived and released as a condition of and in consideration for the execution of this agreement and of said legend endorsed on the Notes.

EIGHTH: All covenants and agreements herein contained shall bind and inure to the benefit of the successors of the parties hereto respectively, and any successor Agent duly acting as such under the terms of the Loan Agreement or any trustee acting under any indenture pursuant to which Notes have been issued shall be deemed to be a successor of the Agent under the provisions of this agreement.

NINTH: This agreement shall be deemed to be a contract made under and shall be construed in accordance with and governed by the laws of the State of New York. Neither this agreement nor any provision hereof may be changed, waived, discharged or terminated orally but only

by an instrument in writing signed by the party against which enforcement of the change, waiver, discharge or termination is sought.

IN WITNESS WHEREOF the parties hereto have executed this agreement as of the day and year above set forth.

CENTRAL HUDSON GAS & ELECTRIC CORPORATION

By ERNEST N. ACKER
President

THE CINCINNATI GAS & ELECTRIC COMPANY

By WALTER (Illegible)
President

[6278]

COLUMBUS AND SOUTHERN OHIO ELECTRIC COMPANY

By H. M. MILLER
President

CONSUMERS POWER COMPANY

By D. E. KARN
President

DELAWARE POWER & LIGHT COMPANY

By H. H. PLACEK
President

THE DETROIT EDISON COMPANY

By WALKER L. CISLER
President

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

By CHARLES H. WHIOMNY
President

LONG ISLAND LIGHTING COMPANY

By R. G. OLMSTED
Vice President

PHILADELPHIA ELECTRIC COMPANY

By R. G. RINCLIFFE,
President

[6279]

POTOMAC ELECTRIC POWER COMPANY

By R. ROY DUNN
President

ROCHESTER GAS AND ELECTRIC CORPORATION

By R. E. GUNNA
President

THE SOUTHERN COMPANY

By (Illegible) BAUCH, JR.
President

WISCONSIN ELECTRIC POWER COMPANY

By G. W. VAN DERZEE
Chairman of the Board

J. P. MORGAN & Co. INCORPORATED

As Trustee of various pension trusts

By L. S. HASKINS

Vice President

BANKERS TRUST COMPANY

As Trustee of various pension trusts

By C. WADSWORTH FARNUM

Vice President

THE CHASE MANHATTAN BANK

As Trustee of various pension trusts

By JAMES J. O'BRIEN

Vice President

[6280]

THE FIRST NATIONAL CITY BANK OF NEW YORK

As Trustee of various pension trusts

By H. B. McADAMS

Vice President

CITY BANK FARMERS TRUST COMPANY

As Trustee of various pension trusts

By H. B. McADAMS

Vice President

BANKERS TRUST COMPANY

As Trustee under agreement with American
Brake Shoe Company dated May 17, 1940

By C. WADSWORTH FARNUM
Vice President

J. P. MORGAN & Co. INCORPORATED

As Agent

By JOHN M. MEYER, JR.
Sr. Vice President

POWER REACTOR DEVELOPMENT COMPANY

By ERNEST R. ACKER
Vice President

APPLICATION EXHIBIT XLI-A

Reference Line
In Exhibit XI
Schedule No. 1

Reference
Authority

Line 7.

CORE PROCESSING COSTSAqueous processing

Process throughput, kg/yr

Cost is derived from a charge of \$102.00 per kg.

Clean-up Time

4 days at \$15,300 per day

Convert U Salts to MetalCost is derived from a charge of \$35 for UNH conversion to UF₆ and \$70 for UF₆ conversion to metal per kg of throughput.Convert PU Salts to Metal

Core PU production, kg/yr

Cost is derived from a charge of \$1500 per kg of core PU production

Scrap Recovery Costs

Uranium returned to AEC as scrap

Cost is derived from a charge of \$67.50 per kg based on 20 per cent of uranium required from ABC

Line 7.

Total, Core Processing Costs

Line 8.

BLANKET PROCESSING COSTSAqueous processing

Process throughput, kg/yr

Cost is derived from a charge of \$15.30 per kg of throughput.

Clean-up Time

4 days at \$15,300 per day

Convert PU Salts to Metal

Blanket PU production, kg/yr

Cost is derived from a charge of \$1500 per kg of Blanket PU Production.

Storage Drum Cost

Line 8.

Total, Blanket Processing

Year	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Process throughput, kg/yr	1,955	2,735	2,670	3,190	2,681	2,811	2,618	2,800	3,021	2,927
Cost is derived from a charge of \$102.00 per kg.	300	280	273	327	275	287	272	287	310	310
Clean-up Time 4 days at \$15,300 per day	61	61	61	61	61	61	61	61	61	61
Convert U Salts to Metal										
Cost is derived from a charge of \$35 for UNH conversion to UF ₆ and \$70 for UF ₆ conversion to metal per kg of throughput.	205	288	281	337	283	357	280	276	319	315
Convert PU Salts to Metal										
Core PU production, kg/yr	8.85	15.75	21.06	27.45	28.97	39.26	36.82	36.66	42.03	42.18
Cost is derived from a charge of \$1500 per kg of core PU production	13	24	33	41	43	59	55	55	63	63
Scrap Recovery Costs Uranium returned to AEC as scrap	717	657	997	821	778	931	673	821	986	813
Cost is derived from a charge of \$67.50 per kg based on 20 per cent of uranium required from ABC	48	44	67	55	52	63	45	55	67	57
Total, Core Processing Costs	527	697	715	821	714	769	713	754	820	810
<u>BLANKET PROCESSING COSTS</u>										
<u>Aqueous processing</u>										
Process throughput, kg/yr	4,206	12,389	18,252	20,995	50,335	27,289	25,630	28,107	32,370	54,242
Cost is derived from a charge of \$15.30 per kg of throughput.	64	190	279	321	770	417	392	430	495	830
Clean-up Time 4 days at \$15,300 per day	61	61	61	61	61	61	61	61	61	61
Convert PU Salts to Metal										
Blanket PU production, kg/yr	6.01	28.68	48.76	60.65	119.13	83.11	78.62	86.46	114.55	159.97
Cost is derived from a charge of \$1500 per kg of Blanket PU Production.	9	43	73	91	179	125	118	130	172	240
Storage Drum Cost	1	1	1	1	1	1	1	1	1	1
Total, Blanket Processing	135	295	414	474	1011	604	572	622	729	1132

Throughput
Quantities by
AFDA, W. N.
McDaniels: (Exhibit VII)

Process Costs
derived from
Chicago Operations Office,
USAEC, Teletype
Feb. 25, 1957

Throughput
Quantities by
AFDA, W. N.
McDaniels.

Process Costs
derived from
Chicago Operations Office,
USAEC, Teletype
February 25,
1957.

Reference Line
in Exhibit II
Schedule No. 1

Exhibit II-La
Sheet 2

Reference Line in Exhibit II Schedule No. 1	Year:	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	Reference Authority
Line 9	<u>ADDITIONAL FUEL CYCLE COSTS</u>											
	<u>Core Shipping</u>											
	Cost is derived from a charge of \$20 per kg of core process throughput	39	55	54	64	54	57	52	56	60	60	APDA, J. Hanna
	<u>Blanket Shipping</u>											
	Cost is derived from a charge of \$1 per kg of blanket process throughput	4	12	18	21	50	27	26	28	32	54	APDA, J. Hanna
	<u>Core Fabrication</u>											
	Core elements fabricated per yr.	131	120	182	150	142	170	123	150	180	154	APDA, J. Hanna
	Cost is derived from a charge of \$2000 per element including axial blanket	262	240	364	300	284	340	246	300	360	308	APDA, J. Hanna
	<u>Blanket Fabrication</u>											
	Blanket elements fabricated per yr.	96	164	276	602	308	324	356	372	722	328	APDA, J. Hanna
	Cost is derived from a charge of \$600 per element	58	98	122	139	395	197	185	204	238	424	APDA, J. Hanna
	<u>Core Material Replacement</u>											
	U 235 destroyed, kg per yr.	27.6	48.8	68.5	85.6	89.5	123.9	114.9	121.1	131.5	132.2	
	Cost is derived from a charge of \$16.40 per kg gram of U 235 destroyed	452	801	1,122	1,404	1,469	2,032	1,884	1,985	2,158	2,167	AEC
	<u>Blanket Material Replacement</u>											
	Depleted U replacement, kg per yr.	10,416	14,919	24,555	46,716	25,709	27,616	28,576	30,455	56,031	27,455	APDA, J. Hanna
	Cost is derived from a charge of \$2.60 per kg of depleted U replacement	27	39	64	121	67	72	74	79	146	71	AEC
	<u>Control Poison Replacement</u>											
	Estimated Cost	2	2	4	4	4	5	4	5	5	5	APDA, J. Hanna
	<u>Special Material Rental</u>											
	Kg of depleted U in int. on inventory valued at \$2.60 per kg				60,406	60,290	63,157	65,419	88,966	62,020		
	Kg. of core uranium inventory in int. on inventory valued at \$4,419.20 per kg				3,588	3,960	3,588	3,588	3,942	3,785	7	APDA, J. Hanna
					634	700	634	634	697	669		
Line 9	Total, additional fuel cycle costs	844	1,247	1,748	2,053	2,963	3,436	3,112	3,238	3,705	3,765	

[6290]

Letter from H. L. Price, August 4, 1956

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

Aug 4 1956

Power Reactor Development Company
1911 First Street
Detroit 26, Michigan

Gentlemen:

Enclosed is a construction permit issued by the Atomic Energy Commission authorizing Power Reactor Development Company to construct the utilization facility described therein.

The issuance of this permit is based on the information and representations contained in your original application filed on January 7, 1956, and amendments thereto filed on June 6, 1956, July 12, 1956, July 20, 1956, and July 23, 1956, including PRDC's program for carrying out further investigations and experiments leading to the final design of the proposed reactor.

As specified in the construction permit, prior to taking action on the conversion of the construction permit to a license to operate the facility, a final Hazards Summary Report must be submitted to AEC for evaluation and a determination that the reactor can, in fact, be operated without undue risk to the health and safety of the public.

As stated in the construction permit the Commission believes that the safety problems associated with the reactor will prove to be of a kind which can be resolved within a reasonable time. The Commission regards the fast breeder program as a very important program and will use its best efforts to assist the company to resolve these problems as completely and as quickly as possible. However, the Commission wants it to be clearly understood that in issuing this construction permit the emphasis is on the fact that it is a conditional one and that the Commission can make no commitment to convert the permit to a license until it is satisfied on all safety matters.

Also, as you are aware, PRDC has not submitted to date sufficient information for the Commission to make a finding with respect to financial qualifications. Paragraph 3d of the permit contains a condition that its continued effectiveness will be dependent upon a showing

[6291]

within 12 months by PRDC that its financial resources are such as to enable the Commission to make the required finding, unless for good cause shown the Commission extends the time for submission of such data.

You will observe that the final paragraph of this permit establishes an allocation of 3,929 kilograms of continued U-235 for use in connection with the operation of this facility. This allocation represents the quantity of U-235 estimated to be required for burn-up and losses, plus inventory. You will also observe that shipments of U-235 by the Commission to PRDC in accordance with Schedule 1 of the Appendix to the permit will be conditioned upon

PRDC's return to the Commission of material substantially in accordance with schedule 2 of the Appendix. The issuance of this permit and the allocation of U-235 contained therein is not to be construed as a commitment by the Commission to supply the U-235 in any form except UF6.

The issuance of this permit does not constitute a commitment on the part of the Commission to provide transportation or processing services with respect to the spent fuel.

Pursuant to established Commission policy, the Commission will undertake to supply PRDC's Boron 10 requirements, under appropriate terms and conditions and within the limitations of available supply, until such time as Boron-10 is available from a commercial source of supply.

An allocation of source material in the form of depleted uranium is not being made at this time pending completion of a study of the classification of this material.

Please communicate with us in the event you have any questions concerning any of the provisions of the construction permit.

Sincerely yours,

/s/ H. L. PRICE,

H. L. PRICE,

*Director, Division of
Civilian Application.*

Enclosure

[6292]

Construction Permit, August 4, 1956**UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.**

Seal

No. CPPR-4

CONSTRUCTION PERMIT

Power Reactor Development Company of Detroit, Michigan (hereinafter "PRDC") on January 7, 1956, filed its application for license under Section 104b of the Atomic Energy Act of 1954 (hereinafter "the Act") to construct and operate a nuclear reactor (hereinafter "the reactor"). Amendments to the application were filed on June 6, 1956, July 12, 1956, July 20, 1956 and July 23, 1956. The original application together with said amendments is hereinafter referred to as "the application".

In its application PRDC has presented information on the general design of the reactor and its program for carrying out further investigations leading to a final design of the reactor. Based on the information submitted by PRDC, the Atomic Energy Commission (hereinafter "the Commission") has found that:

- A. The reactor will be a utilization facility as defined in the Commission's regulations contained in Title 10, Chapter 1, C. F. R., Part 50, "Licensing of Production and Utilization Facilities".
- B. The reactor will be a utilization facility involved in the conduct of research and development activities leading to the demonstration of the practical value

of that type of facility for industrial or commercial purposes.

C. PRDC, Atomic Power Development Associates, Commonwealth Associates, Inc., and United Engineers and Constructors, Inc., are technically qualified to design and construct said reactor.

D. (1) There are identified areas of uncertainty regarding the hazards potential of fast neutron breeder reactors that must be investigated and resolved. From the current state of the technology applicable to such reactors it can reasonably be inferred that there may be other areas of uncertainty not yet identified and requiring investigation and resolution. Of primary importance among the identified areas of uncertainty are:

(a) Whether there exists in the PRDC reactor a positive component of the temperature coefficient similar to that exhibited in the Commission's experimental breeder reactor

[6293]

(EBR-I). The source of the positive component of the temperature coefficient exhibited by EBR-I (presently believed to be caused by dimensional distortion of the core structure) must be identified and its effect, if any, in the PRDC reactor must be eliminated.

- (b) Whether there is a credible condition of meltdown and reassembly of the fuel of the PRDC reactor which could result in an explosion that would breach the gas-tight building surrounding the reactor. Further investigations must be carried out to establish that a credible condition of meltdown with consequent U-235 accumulation of critical dimensions cannot result in such an explosion.
- (2) On the basis of information presently available, the Commission believes that the problems relating to the safety of operation of the PRDC reactor will prove to be of a kind that can be satisfactorily resolved within a reasonable time. There is some doubt whether they can be resolved in time to meet the schedule proposed by PRDC in its application and it may turn out that further investigations beyond the program of investigation outlined by PRDC in its application will be needed.
- E. Although PRDC has submitted evidence of a commitment from certain banks for a loan of \$15,000,000 and has described its plan for obtaining additional financing from its member companies, the evidence submitted to date does not justify a finding with respect to the financial qualifications of PRDC and accordingly the continued effectiveness of this permit will be conditioned upon a further showing in this regard as stated below.

Pursuant to the Atomic Energy Act of 1954 and Title 10, C. F. R., Chapter 1, Part 50, "Licensing of Production and

Utilization Facilities," the Commission hereby issues a conditional construction permit to PRDC to construct the reactor as a utilization facility. This permit shall be deemed to contain and be subject to the conditions specified in Sections 50.54 and 50.55 of said regulations; is subject to all applicable provisions of the Atomic Energy Act of 1954 and rules, regulations and orders of the Atomic Energy Commission now or hereafter in effect; and is subject to the conditions specified below:

- A. The earliest date for the completion of the reactor is December 15, 1959. The latest date for completion of the reactor is December 15, 1960. The term

[6294]

"completion date" as used herein means the date on which construction of the reactor is completed except for the introduction of the fuel material.

- B. The site proposed for the location of the reactor is the location known as Lagoon Beach, Monroe County, Michigan, specified in the application.
- C. The general type of facility authorized for construction is a fast neutron breeder reactor, more fully described in Report APDA-108, designed to operate at 300,000 KW equivalent of thermal energy and furnish approximately 100,000 kilowatts of electrical energy, and which will use uranium enriched in the isotope uranium 235 as fuel.
- D. Unless, within twelve months from the date of this construction permit, PRDC submits sufficient information relating to its financial resources to enable

the Commission to make a finding that the Company has adequate financial resources to meet the requirements of the law and the regulations, this permit shall expire; provided that the Commission may for good cause shown extend the time for the submission of such data:

The conversion of this permit to a license is subject to submittal by PRDC to the Commission (by amendment of the application) of the complete, final Hazards Summary Report (portions of which may be submitted and evaluated from time to time). The final Hazards Summary Report must show that the final design provides reasonable assurance to the satisfaction of the Commission that the health and safety of the public will not be endangered by operation of the reactor in accordance with the specified procedures.

Upon completion (as defined in Paragraph "A" above) of the construction of the facility in accordance with the terms and conditions of this permit, upon the filing of any additional information needed to bring the original application up to date, upon finding that the final design provides reasonable assurance that the health and safety of the public will not be endangered by operation of the reactor in accordance with the specified procedures, and upon finding that the facility authorized has been constructed in conformity with the application as amended and in conformity with the provisions of the Act and of the rules and regulations of the Commission, and in the absence of any good cause being shown to the Commission why the granting of a license would not be in accordance with the provisions of the Act, the Commission will issue

a Class 104 license to PRDC pursuant to Section 104b of the Act, which license shall expire twenty-five (25) years after the date of this construction permit.

[6295]

From time to time PRDC may submit to the Commission, in writing, reports upon the progress being made in experimental and developmental work. Following the submission of each such report the Commission will review the data included therein to determine whether the results of such work can be incorporated as technical specifications by appropriate amendment to this permit.

Pursuant to Section 50.60 of the regulations in Title 10, Chapter 1, C. F. R., Part 50, the Commission has allocated to PRDC, for use in connection with the operation of the reactor, 3,929 kilograms of uranium 235 contained in uranium at the isotopic ratios specified in PRDC's application for license. Shipments by the Commission to PRDC in accordance with Schedule 1 of the Appendix hereto will be conditioned upon PRDC's return to the Commission of material substantially in accordance with Schedule 2 of the Appendix.

FOR THE ATOMIC ENERGY COMMISSION

H. L. PRICE

Director

Division of Civilian Application

Attachment:

Appendix "A"

Date of Issuance: August 4, 1956

[6296]

APPENDIX "A" TO CONSTRUCTION PERMIT

SCHEDULE 1

Estimated Schedule of Transfers of Special Nuclear Material from the Commission to PRDC

<i>Year of Transfer</i>	<i>Kilograms of Contained U-235</i>
1958	607
1959	0
1960	607
1961	1819
1962	1819
1963	3032
1964	1819
1965	3031
1966	2426
1967	1819
1968	1819
1969	1819
1970	1819
1971	1212
1972	1819
1973	1819
1974	1212
1975	1819
1976	1819
1977	1819
1978	1212
1979	1819
1980	1819

Total for License Period 38,805

[6297]

APPENDIX "A" TO CONSTRUCTION PERMIT

SCHEDULE 2

Estimated Schedule of Transfers of Special Nuclear Material from PRDC to the Commission

Year of Transfer	Kilograms of Contained U-235		Total
	In Scrap	In Spent Fuel	
1958	122	0	122
1959	0	0	0
1960	122	0	0
1961	363	920	1283
1962	363	920	1283
1963	606	1839	2445
1964	363	2299	2662
1965	606	1362	1968
1966	485	2269	2754
1967	363	1792	2155
1968	363	1326	1689
1969	363	1309	1672
1970	363	1309	1672
1971	242	873	1115
1972	363	1309	1672
1973	363	1309	1672
1974	242	873	1115
1975	363	1309	1672
1976	363	1309	1672
1977	363	1309	1672
1978	242	873	1115
1979	363	1309	1672
1980	363	1309	1672

Total for License Period 34,876

Appendix "A"

[6298]

UAW Petition for Intervention

Before the
United States Atomic Energy Commission

in re

License Application of Power Reactor Development
Company

AEC Docket No. F-16

**PETITION FOR INTERVENTION AND REQUEST
FOR FORMAL HEARING**

Now come the International Union, United Automobile, Aircraft and Agricultural Implement Workers of America, affiliated with the American Federation of Labor-Congress of Industrial Organizations, hereinafter referred to as UAW, Walter P. Reuther, President and a member of said UAW, Emil Mazey, Secretary Treasurer and a member of said UAW, and Carlos Gastambide, President of Local 878, UAW, and a member of said UAW, hereinafter referred to as Intervenors, and file herewith their petition to intervene in these proceedings under the Commission's Rules of Practice, Section 2.705, Title 10, CFR, on behalf of themselves and on behalf of and as representatives of the members of said UAW similarly situated, on the following grounds to wit:

[6299]

I. Intervenors state that each of said individual Intervenors resides, works and owns property within an area of

approximately forty miles of Lagoona Beach, Monroe County, Michigan, and that said Intervenor Carlos Gastambide is a resident of Monroe, Michigan. Intervenor further state that said Intervenor UAW is an unincorporated labor association composed of in excess of 1,500,000 members with principal offices at Detroit, Michigan; that said UAW admits to membership employees employed in plants and shops engaged in the manufacture of parts and the assembly of those parts into farm, automobile, automotive-propelled products, aircraft and agricultural implements, including employees engaged in office work, sales, distribution and maintenance thereof; that Walter P. Reuther is the duly elected President of said UAW, that Emil Mazey is the duly elected Secretary-Treasurer of said UAW, and that Carlos Gastambide is the duly elected President of said Local 878, UAW; that said Local 878, UAW, is composed of in excess of 1,000 members who are employed and reside in the vicinity of Monroe, Michigan; that the members of said UAW similarly situated on whose behalf this action is brought constitute a class so numerous as to make it impractical to bring them all before the Atomic Energy Commission; that the Intervenor herein will fairly insure the adequate representation of all, and that there are common questions of law and fact affecting the rights of the Intervenor and said members of the UAW, and that common relief is sought.

[6300]

II. Intervenor further state that on or about August 4, 1956 the Atomic Energy Commission granted a "conditional" construction permit in these proceedings to the Power Reactor Development Company of Detroit, Michi-

gan, hereinafter referred to as PRDC, for the construction of a fast neutron-breeder reactor more fully described in Report ABDA-108, designed to operate at 300,000 kw. equivalent of thermal energy and furnish approximately 100,000 kilowatts of electrical energy and which will use uranium enriched in the isotope uranium 235 as fuel; that the location specified for the construction of the facility is Lagoon Beach, Monroe County, Michigan. The "conditional" construction permit also "allocated" to PRDC special nuclear material for operation of the reactor during the period of the license.

III. Intervenors further state that Lagoon Beach, Monroe County, Michigan, is located approximately thirty miles from the cities of Toledo, Ohio, and Detroit, Michigan, and approximately seven and one-half miles from the city of Monroe, Michigan; that Monroe, Michigan has a population in excess of 21,000; Detroit, Michigan has a population in excess of 1,849,000; and Toledo, Ohio has a population in excess of 303,500; that within the cities of Detroit, Toledo, Monroe and vicinity there is a large concentration of members of said UAW; that there are in excess of 30,000

[6301]

members in the city of Toledo, in excess of 260,000 members in the city of Detroit, and in excess of 4,000 members in the city of Monroe; that, in addition to the above-described areas the UAW has many other members dwelling within an area which would be subjected to the impact of an atomic catastrophe caused by said reactor.

IV. Intervenors further state that said members are employed in shops, factories and industrial establishments

within said areas and that said UAW, together with its Locals, has collective bargaining agreements with employers in said shops, factories and industrial establishments; that the UAW owns real estate and other property, including its international headquarters, in said areas in excess of two million dollars (\$2,000,000), that UAW Local 12 operates a summer camp for boys and girls at Sand Lake, Michigan, within a radius of forty miles from Lagoona Beach, Michigan, that said members own real estate and other property in said areas in excess of five hundred million dollars (\$500,000,000), and that the individual Intervenor owners own real-estate and other property in said areas in excess of thirty thousand dollars (\$30,000).

V. Intervenor owners further state that the action of the AEC in granting the conditional construction permit herein (1) is a violation of the provisions of the Atomic Energy Act of 1954, and the regulations pursuant thereto

[6302]

adopted by the Commission, as more specifically set forth below; and (2) will result in the construction of a reactor which, under present technological conditions, is inherently unsafe, and which will thereby create a hazard which will place the individual Intervenor owners, the members of UAW and their families, and the UAW in danger of an explosion or other incident having the following effects:

(a) It would imperil and destroy the health and lives of said individual Intervenor owners, members, and their families.

(b) It would imperil and destroy the homes and other property in which said individual Intervenor owners and members have substantial investments.

(c) It would imperil and destroy the real estate holdings and other property, including the international headquarters, of said UAW.

(d) It would imperil and destroy the establishments at which said members are employed, and would result in a deprivation of facilities within said cities wherein said members earn a livelihood.

(e) It would depress the value of real estate and other property owned by said individual Intervenor, by said members, and by said UAW, and would influence industry to leave said areas which might be affected by an atomic catastrophe.

[6303]

(f) It would imperil the status of collective bargaining and would destroy the property rights of said UAW and its members in collective bargaining agreements with employers in said areas.

(g) It would contaminate the water supply of the city of Monroe and would imperil the usability of said city as a port on Lake Erie.

VI. Intervenor further state that one of the principal functions of the UAW is to protect the health and safety of its members, particularly in their places of employment. In the performance of this function it seeks to obtain suitable provisions in collective bargaining agreements protecting the health and safety of covered employees. It engages in educational campaigns, providing its members with information essential to the protection of their health and safety. It seeks to obtain remedial legislation on local,

state and national levels, promoting the health and safety of its members and all workers.

VII. Intervenors further state that the UAW has collective bargaining agreements with several hundred employers within a hundred-mile radius of Monroe, Michigan. More than five hundred thousand of its members are employed under the terms and provisions of said agreements within the plants located in said area. The existence of these plants as well as the safety of the employees working therein under contracts are placed

[6304]

in jeopardy by the aforesaid action of the Commission. The value of these contracts will be seriously impaired if the PRDC reactor is built in this area without reasonable assurances of safety.

VIII. Intervenors further state that the statutory standard for issuance of construction permits is established by Section 185 of the Atomic Energy Act of 1954, which provides as follows:

"Sec. 185. Construction Permits.—All applicants for licenses to construct or modify production or utilization facilities shall, if the application is otherwise acceptable to the Commission, be initially granted a construction permit. The construction permit shall state the earliest and latest dates for the completion of the construction or modification. Unless the construction or modification of the facility is completed by the completion date, the construction permit shall expire, and all right thereunder be forfeited, unless

upon good cause shown, the Commission extends the completion date. Upon the completion of the construction or modification of the facility, upon the filing of any additional information needed to bring the original application up to date, and upon finding that the facility authorized has been constructed and will operate in conformity with the application as amended and in conformity with the provisions of this Act and of the rules and regulations of the Commission, and in the absence of any *good cause* being shown to the Commission why the granting of a license would not be in accordance with the provisions of this Act, the Commission shall thereupon issue a license to the applicant. For all other purposes of this Act, a construction permit is deemed to be a 'license.' (Emphasis added.)

IX. Intervenors further state that the rules and regulations officially promulgated by the AEC establish the AEC's standards for implementing the statutory requirement that a construction permit shall

[6305]

be initially granted if the application is "otherwise acceptable to the Commission." Section 50.45, Title 10, CFR, provides as follows:

"Section 50.45 *Standards for Construction Permits*

Any applicant for a license or an amendment of a license who proposes to construct or alter a production or utilization facility will be initially granted a construction permit, *if the application is in conformity*

with and acceptable under the criteria of Sections 50.31 through 50.38 and the standards of Sections 50.40 through 50.43." (Emphasis added.)

Intervenors allege, as hereinafter more fully set forth, that said PRDC's construction permit is not in conformity with and acceptable under the criteria of said Sections nor of the statutes made and provided.

X₃ Intervenors further state that Section 50.40 of the AEC's rules and regulations establishes standards which the application of PRDC must be "in consistency with and acceptable under." Section 50.40 provides:

"Section 50.40 Common Standards

In determining that a license will be issued to an applicant, the Commission will be guided by the following considerations:

(a) The processes to be performed, the operating procedures, the facility and equipment, the use of the facility, and other technical specifications, or the proposals in regard to any of the foregoing collectively *provide reasonable assurance that the applicant will comply with the regulations in this chapter, including the regulations in Part 20, and that the health and safety of the public will not be endangered.*

[6306]

(b) *The applicant is technically and financially qualified to engage in the proposed activities in accordance with the regulations in this chapter.*

(c) The issuance of a license to the applicant will not, in the opinion of the Commission, be inimical to

the common defense and security or to the health and safety of the public." (Emphasis added.)

XI. Intervenors further state that the AEC's rules and regulations, Section 50.35, Title 10, CFR, provide:

"Section 50.35 Extended Time for Providing Technical Information

Where, because of the nature of a proposed project, an applicant is not in a position to supply initially all of the technical information otherwise required to complete the application, she shall indicate the reason; the items or kinds of information omitted, and the approximate times when such data will be produced. *If the Commission is satisfied that it has information sufficient to provide reasonable assurance that a facility of the general type proposed can be constructed and operated at the proposed location without undue risk to the health and safety of the public and that the omitted information will be supplied, it may process the application and issue a construction permit on a provisional basis without the omitted information subject to its later production and an evaluation by the Commission that the final design provides reasonable assurance that the health and safety of the public will not be endangered.*" (Emphasis added.)

XII. Intervenors further state that the AEC did not make the finding requisite to the grant of a construction permit on a provisional basis under the aforesaid Section 50.35, i.e., that:

[6307]

"... the Commission is satisfied that it has information sufficient to provide reasonable assurance that a facility of the general type proposed can be constructed and operated at the proposed location without undue risk to the health and safety of the public ..."

The other construction permits issued to date on a provisional basis have included this finding.

XIII. Intervenors further state that the AEC has made findings, recited in the "conditional" construction permit issued to PRDC, which are inconsistent with and contrary to the finding of "reasonable assurance" required by said Section 50.35. The AEC has found that there are "identified areas of uncertainty" regarding the hazards potential of the type of reactor proposed by PRDC, and that "from the current state of the technology . . . it can reasonably be inferred that there may be other areas of uncertainty not yet identified."

XIV. Intervenors further state that the AEC acted illegally, contrary to the provisions of Section 185 of the Atomic Energy Act, and contrary to the provisions of its own rules and regulations interpreting and implementing Section 185, in issuing the "conditional" construction permit without making the required finding of "reasonable assurance."

XV. Intervenors further state that Section 185 of the Atomic Energy Act of 1954 (quoted in Paragraph VIII hereof), as implemented and interpreted by Section 50.40(b), Title 10, CFR (quoted in Paragraph X hereof),

[6308]

requires as a condition of issuance of a construction permit that the AEC find that the applicant is "financially qualified to engage in the proposed activities" in accordance with AEC regulations.

XVI. Intervenors further state that Section 50.60(b) of the AEC's regulations provides that where an applicant for a facility license requests that special nuclear material be allocated for use in the facility at the time the construction permit is issued, as PRDC requested in this case, the:

" . . . request should be accompanied by *at least* the following information:

(1) The applicant's *financial qualifications to assume responsibility for payment of Commission charges for the materials, and to undertake and carry out the proposed use of special nuclear material for a reasonable period of time; . . .*" (Emphasis added.)

XVII. Intervenors further state that Section 50.60(c) provides that

"(c) A request for the incorporation in a construction permit or license of provisions designating the amount of special material available for use by the facility *will be approved by the Commission if: . . .*

(2) The applicant *appears to be financially qualified* to assume responsibility for the payment of Commission charges for the material and to undertake and carry out the proposed use of special nuclear material for a reasonable period of time; and" (Emphasis added.)

XVIII. Intervenors further state that PRDC's license application included vague information as to its general financial qualifications; but

[6309]

PRDC failed to comply with said Section 50.60, Title 10, CFR, in that it did not submit information specifically relating to its financial qualifications to assume responsibility for payment of the AEC's charges for special nuclear material and to undertake and carry out the proposed use of the material for a reasonable time.

XIX. Intervenors further state that the AEC's regulations clearly require that a finding of financial qualification must be made *before* a construction permit is issued and *before* special nuclear material is allocated, and that there is no provision in the regulations for issuing a construction permit or allocating special nuclear material "conditional" upon subsequent submission of evidence as to financial qualifications. The AEC did not make the finding, required under Sections 50.45 (quoted in Paragraph IX hereof) and 50.40 (quoted in Paragraph X hereof), Title 10, CFR, as a prerequisite for issuance of a construction permit, that PRDC was "financially qualified to engage in the proposed activity" in accordance with AEC regulations. Nor did the AEC make the finding required under Section 50.60(e)(2) (quoted in Paragraph XVII hereof) that PRDC "appears to be financially qualified" to assume responsibility for payment of AEC charges for material and to undertake and carry out the proposed use of the material for a reasonable time. On the contrary,

the "conditional" construction permit issued to PRDC recites the AEC's finding that:

" . . . the evidence submitted to date does not justify a finding with respect to the financial qualifications of PRDC."

[6310]

XX. Intervenors further state that the AEC acted illegally, contrary to the provisions of Section 185 of the Atomic Energy Act, and contrary to the provisions of its own rules and regulations interpreting and implementing Section 185, in issuing to PRDC a "conditional" construction permit and in including in the permit an allocation of special nuclear material without the aforesaid requisite findings of "financial qualification."

XXI. Intervenors further state that the license application filed by PRDC reveals that PRDC's financial qualification is dependent upon the United States Government's acceding to three conditions laid down by PRDC: (a) statutory exemption of PRDC and its member companies from the provisions of the Public Utility Holding Company Act; (b) a ruling by the Internal Revenue Service that contributions of members to PRDC are deductible for federal income tax purposes; and (c) provision for adequate insurance protection against liability for damage claims arising from a catastrophe caused by its reactor. None of these three conditions had been met at the time the "conditional" construction permit was issued. AEC's issuance of the "conditional" construction permit under these circumstances was arbitrary, unreasonable, an abuse of dis-

cretion, and a violation of the applicable provisions of the statute and regulations.

[6311]

XXII. Intervenors further state that one of the purposes of the Atomic Energy Act of 1954 is, as stated in Section 3(d) of said Act, to provide for:

"a program to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes *to the maximum extent consistent with the common defense and security and with the health and safety of the public.*" (Emphasis added.)

Numerous provisions of the Act impose an affirmative duty upon the AEC to administer and regulate atomic energy developments in a manner which will assure the health and safety of the public. Thus, Section 104(b) of the Act, the Section under which the PRDC reactor will ultimately be licensed, refers to the AEC's "obligation under this Act . . . to protect the health and safety of the public."

XXIII. Intervenors further state that the AEC has constituted the Advisory Committee on Reactor Safeguards, consisting at the present time of fourteen eminent scientists and engineers, to assist it in the discharge of its aforesaid "obligation" to protect the health and safety of the public. Said Committee "... reviews safety studies referred to it by the Commission staff and advises the Commission with regard to the hazards of proposed or existing reactor facilities and the adequacy of proposed reactor safety standards."

[6312]

XXIV. Intervenors further state that the AEC, in accordance with its policy of referring all applications for reactor licenses to the Advisory Committee for its review and recommendations, referred the PRDC application to said Committee. On June 6, 1956, the Advisory Committee submitted to the AEC its report on the PRDC reactor. The report has been suppressed by the AEC in violation of the provisions of Section 146(b) of the Atomic Energy Act and Section 2.790, Title 10, CFR. Nevertheless, a member of the AEC and members of the Joint Committee on Atomic Energy have publicly revealed excerpts from the Report which quote the Advisory Committee as finding "that there is insufficient information available at this time to give assurance that the PRDC can be operated at this site without public hazard;" that it is "doubtful" whether sufficient information to give assurance of safe operation of the reactor "will be available in time to give assurance of safe operation of this reactor unless the present fast reactor program of the AEC is amplified and accelerated;" and that even such an accelerated program might not yield sufficient results to permit safe operation of the reactor at the Lagoon Beach site on the time schedule proposed by PRDC.

XXV. Intervenors further state that the Atomic Energy Commission, by a vote of three to one (the majority position being represented by two laymen and one scientist) voted to issue the "conditional" construction

[6313]

permit in disregard of the findings of said Committee, and that this action was arbitrary, unreasonable, capri-

cious, and a violation of the Atomic Energy Act of 1954 and the AEC's rules and regulations!

XXVI. Intervenor further state that Section 185 of the Atomic Energy Act of 1954 (quoted in Paragraph VIII hereof) requires that a construction permit expire and all rights thereunder be forfeited if the facility is not completed by the latest date specified for completion in the license application, unless the AEC "upon good cause shown" extends the completion date. The AEC has incorporated in the "conditional" construction permit issued to PRDC the date submitted by PRDC, December 15, 1960, as the latest date for completion of the reactor, despite the AEC's finding that "there is some doubt" whether the safety problems can be resolved in time to meet the schedule proposed by PRDC. Similar doubts have been expressed in stronger form by the Advisory Committee on Reactor Safeguards, as described in Paragraph XXIV hereof. Issuance of the construction permit with the completion date of December 15, 1960, specified therein, despite these doubts, is in violation of Section 185 since it renders completely meaningless the statutory requirement that construction of reactors be completed within the time limitation specified in the construction permit.

[6314]

XXVII. Intervenor further state that Section 104(d) of the Atomic Energy Act of 1954 provides that:

"... no license may be issued to any person within the United States if, in the opinion of the Commission, the issuance of a license to such person would be inimical . . . to the health and safety of the public."

and that said Commission has an obligation under the Act to protect the health and safety of the public.

XXVIII. Intervenors further state that construction of a fast neutron-breeder reactor, "the most hazardous of all reactors," with its inherent characteristics of instability and hazard, at a site near metropolitan population centers, before such a reactor has been constructed, tested, and experimentally proven in less populated areas, is inimical to the health and safety of the public, and that the AEC violated said Section 104(d), and abused its discretionary authority thereunder, in issuing the "conditional" construction permit to PRDC for construction of a reactor at Lagoon Beach, and ignored its obligation to protect the health and safety of the public.

XXIX. Intervenors further state that the action of the AEC in granting a "conditional" construction permit to PRDC on August 4, 1956, was irresponsible, precipitous, in flagrant violation of the Atomic Energy Act of 1954 and rules and regulations promulgated by the AEC, and

[6315]

provides reasonable grounds for belief that a license to operate said facility when it is completed, with an expenditure of \$45,000,000, will be issued without proper consideration of and regard for the health and safety of the public.

WHEREFORE, said Intervenors pray that the Atomic Energy Commission:

- (1) grant their petition to intervene;

(2) order immediate suspension of the "conditional" construction permit issued to Power Reactor Development Company pending a final determination of the questions raised herein;

(3) set this matter for a formal hearing, in accordance with Part 2, Title 10, CFR, at the earliest possible date; and

(4) rescind and declare a nullity the "conditional" construction permit issued to said Company until such time as there has been full compliance with all pertinent provisions of the statute, rules, and regulations, and said Company has submitted information affording reasonable assurance that a reactor of the type contemplated can be built and operated at the site in question without undue risk to the health and safety of the public.

[6316]

.....
HAROLD A. CRANEFIELD,
General Counsel, UAW-AFL-CIO,
8000 East Jefferson Avenue,
Detroit 14, Michigan.

.....
BENJAMIN C. SIGAL,
1126 16th Street, N. W.,
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.....
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1700 K Street, N. W.,
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.....
LOWELL GOERLICH,
 718 Jackson Place, N. W.,
 Washington, D. C.
Attorneys for Interrenors.

The foregoing petition for intervention and request for formal hearing has been served upon the PRDC by mailing a true copy thereof, by Registered Mail, to the Power Reactor Development Company at 1100 Dime Building, Detroit 26, Michigan, this 31st day of August, 1956.

.....
Attorney for Interrenors.

[6317]

IUE and Paperworkers Petition for Intervention

UNITED STATES OF AMERICA

BEFORE THE ATOMIC ENERGY COMMISSION

 In the Matter of
**LICENSE APPLICATION OF POWER REACTOR
 DEVELOPMENT COMPANY**

AEC Docket No. F-16

**PETITION FOR INTERVENTION AND REQUEST
 FOR FORMAL HEARING**

Now come the International Union of Electrical, Radio and Machine Workers, affiliated with the American Federa-

tion of Labor and Congress of Labor Organizations, hereinafter referred to as IUE; James B. Carey, President and a member of IUE; Al Hartnett, Secretary-Treasurer and a member of IUE; James Douglas, President of IUE Local 945, and file herewith their petition to intervene in these proceedings for themselves and on behalf, and as representatives, of the members of IUE, and in support of their petition state:

1. IUE is an unincorporated labor association composed of more than 350,000 members, with principal offices in Washington, D. C. IUE admits to membership employees of manufacturers of electrical machinery, appliances and products, tools and dies, machine tools and allied products, including employees engaged in office work, distribution, installation, service, and repair of electrical machinery and equipment. James B. Carey is the duly elected president of IUE; Al Hartnett is the duly elected secretary of IUE; James Douglas is the duly elected President of IUE Local 945, situated in Detroit, Michigan. The members of IUE on whose behalf this petition is filed constitute a class so numerous as to make it impractical to bring them all before the Atomic Energy Commission, hereinafter referred to as AEC. Intervenor herein will fairly ensure the adequate representation of all; there are common questions of law and fact affecting the rights of Intervenor and members of IUE, and common relief is sought.

2. On or about August 4, 1956 the Atomic Energy Commission granted a "conditional" construction permit in these proceedings to the Power Reactor Development Company of Detroit, Michigan, hereinafter referred to as PRDC, for the construction of a fast neutron-breeder reactor more

fully described in Report ABDA-108, designed to operate at 300,000 kw. equivalent of thermal energy and furnish approximately 100,000 kilowatts of electrical energy and which will use uranium enriched in the isotope uranium 235 as fuel. The location specified for the construction of the

[6318]

facility in Lagoon Beach, Monroe County, Michigan. The "conditional" construction permit also "allocated" to PRDC special nuclear material for operation of the reactor during the period of the license. This reactor is hereinafter referred to as PRDC reactor.

3. Lagoon Beach, Monroe County, Michigan, is approximately 30 miles from the cities of Detroit, Michigan, and Toledo, Ohio, and approximately 7 $\frac{1}{2}$ miles from the city of Monroe, Michigan. Detroit has a population in excess of 1,849,000; Toledo has a population in excess of 303,500, and Monroe has a population in excess of 21,000. Within a radius of 30 miles from Lagoon Beach, there is a substantial concentration of members of IUE, and in addition, IUE has many other members dwelling within areas which would be subject to the impact of a catastrophe which would be caused in the event the PRDC reactor exploded or otherwise went out of control.

4. The members of IUE, including Intervenor James Douglas, own real estate and other property in said areas valued in excess of \$10,000,000.

5. IUE has collective bargaining agreements with scores of employers within a 100-mile radius of Lagoon Beach, Monroe County, Michigan. More than 50,000 of its mem-

bers are employed under the terms and provisions of said agreements within the plants located in said area.

6. One of the principal functions of IUE is to protect the health and safety of its members, particularly in their places of employment. In the performance of this function it seeks to obtain suitable provisions in collective bargaining agreements protecting the health and safety of covered employees. It engages in educational campaigns, providing its members with information essential to the protection of their health and safety. It seeks to obtain remedial legislation on local, state and national levels, promoting the health and safety of all workers.

7. The action of AEC in granting the "conditional" permit herein

a. violates the provisions of the Atomic Energy Act of 1954, and the regulations pursuant thereto adopted by AEC, as more specifically set forth below;

b. will result in the construction of a reactor which, under present technological conditions, is inherently unsafe, thereby creating a hazard which will place Intervenor and the members of IUE and their families in danger of an explosion or other incident having the following effects:

(1) It would imperil and destroy the health and lives of the members of IUE and their families;

[6319]

(2) It would imperil and destroy the homes and other property in which the Intervenor and members of IUE have substantial investments;

(3) It would imperil and destroy the establishments at which said members are employed thereby resulting in a deprivation of facilities wherein said members earn their livelihood;

(4) It would depress the value of real estate and other property owned by the Intervenor and members of IUE and would influence industry in which these members work to leave the areas which might be affected by an atomic catastrophe;

(5) It would imperil and destroy the property rights of IUE and its members in collective bargaining agreements with employers in said areas.

8. The statutory standard for issuance of construction permits is established by Section 185 of the Atomic Energy Act of 1954, which provides as follows:

"All applicants for licenses to construct or modify production or utilization facilities, shall, if the application is otherwise acceptable to the Commission, be initially granted a construction permit. The construction permit shall state the earliest and latest dates for the completion of the construction or modification. Unless the construction or modification of the facility is completed by the completion date, the construction permit shall expire, and all rights thereunder be forfeited, unless upon good cause shown, the Commission extends the completion date. Upon the completion of the construction or modification of the facility, upon the filing of any additional information needed to bring the original application up to date, and upon finding that the facility authorized has been constructed and

will operate in conformity with the application as amended and in conformity with the provisions of this chapter and of the rules and regulations of the Commission, and in the absence of any good cause being shown to the Commission why the granting of a license would not be in accordance with the provisions of this chapter, the Commission shall thereupon issue a license to the applicant. For all other purposes of this chapter, a construction permit is deemed to be a 'license'."

9. The rules and regulations officially promulgated by AEC establish AEC's standards for implementing the statutory requirement that a construction permit shall be initially granted if the application is "otherwise acceptable to the Commission." Section 50.45, Title 10, CFR, provides as follows:

"Standards for Construction Permits"

An applicant for a license, or an amendment of a license, who proposes to construct or alter a production or utilization facility will be initially granted a construction permit, if the application is in conformity with and acceptable under the criteria of sections 50.31 through 50.38 and the standards of sections 50.40 through 50.43."

10. Section 50.40 of AEC's rules and regulations provides:

"Common Standards"

In determining that a license will be issued to an applicant, the Commission will be guided by the following considerations:

[6320]

(a) The processes to be performed, the operating procedures, the facility and equipment, use of the facility, and other technical specifications, or the proposals in regard to any of the foregoing collectively provide reasonable assurance that the applicant will comply with the regulations in this chapter, including the regulations in Part 20, and that the health and safety of the public will not be endangered.

(b) The applicant is technically and financially qualified to engage in the proposed activities in accordance with the regulations of this chapter.

(c) The issuance of a license to the applicant will not, in the opinion of the Commission, be inimical to the common defense and security or to the health and safety of the public."

11. AEC's rules and regulations, Section 50.35, Title 10, CFR, provide:

"Extended Time for Providing Technical Information

Where, because of the nature of a proposed project, an applicant is not in a position to supply initially all of the technical information otherwise required to complete the application, he shall indicate the reason, the items or kinds of information omitted, and the approximate times when such data will be produced. If the Commission is satisfied that it has information sufficient to provide reasonable assurance that a facility of the general type proposed can be constructed and operated at the proposed location without undue risk

to the health and safety of the public, and that the omitted information will be supplied, it may process the application and issue a construction permit on a provisional basis without the omitted information subject to its later production, and an evaluation by the Commission that the final design provides reasonable assurance that the health and safety of the public will not be endangered."

12. AEC did not make the finding requisite to the grant of a construction permit on a provisional basis under the aforesaid Section 50.355, i.e., that:

"* * * the Commission is satisfied that it has information sufficient to provide reasonable assurance that a facility of the general type proposed can be constructed and operated at the proposed location without undue risk to the health and safety of the public * * *"

The other construction permits issued to date on a provisional basis have included this finding.

13. AEC has made findings, recited in the "conditional" construction permit issued to PRDC, which are inconsistent with and contrary to the finding of "reasonable assurance" required by said Section 50.35. AEC has found that there are "identified areas of uncertainty" regarding the hazards potential of the type of reactor proposed by PRDC, and that "from the current state of the technology * * * it can reasonably be inferred that there may be other areas of uncertainty not yet identified."

14. AEC acted illegally, contrary to the provisions of Section 185 of the Atomic Energy Act, and contrary to the provisions of its own rules and regulations interpreting and

implementing Section 185, in issuing the "conditional" construction permit without making the required finding of "reasonable assurance."

[6321]

15. Section 185 of the Atomic Energy Act of 1954, quoted above, as implemented and interpreted by Section 50.40(b), Title 10, CFR quoted above, requires as a condition of issuance of a construction permit that the AEC find that the applicant is "financially qualified to engage in the proposed activities" in accordance with AEC regulations.

16. Section 50.60(b) of the AEC's regulations provides that where an applicant for a facility license requests that special nuclear material be allocated for use in the facility at the time the construction permit is issued, as PRDC requested in this case, the:

"* * * request should be accompanied by at least the following information:

(1) *The applicant's financial qualifications to assume responsibility for payment of Commission charges for the materials, and to undertake and carry out the proposed use of special nuclear material for a reasonable period of time; * * ** (Emphasis added.)

17. Section 50.60(c) provides that:

"(c) A request for the incorporation in a construction permit or license of provisions designating the amount of special material available for use by the facility *will be approved by the Commission if: * * **

(2) *The applicant appears to be financially qualified to assume responsibility for the payment of Commission charges for the material and to undertake and carry out the proposed use of special nuclear material for a reasonable period of time; and * * ** (Emphasis added.)

18. PRDC's license application included vague information as to its general financial qualifications, but PRDC failed to comply with said Section 50.60, Title 10, CFR, in that it did not submit information specifically relating to its financial qualifications to assume responsibility for payment of AEC's charges for special nuclear material and to undertake and carry out the proposed use of the material for a reasonable time.

19. AEC's regulations require that a finding of financial qualification must be made *before* a construction permit is issued and *before* special nuclear material is allocated. There is no provision in the regulations for issuing a construction permit or allocating special nuclear material "conditional" upon subsequent submission of evidence as to financial qualifications. AEC did not make the finding, required under Sections 50.45 and 50.40, Title 10, CFR, quoted above, as a prerequisite for issuance of a construction permit, that PRDC was "financially qualified to engage in the proposed activity" in accordance with AEC regulations. Nor did AEC make the finding required under Section 50.60(c)(2), quoted above, that PRDC "appears to be financially qualified" to assume responsibility for payment of

[6322]

AEC charges for material and to undertake and carry out the proposed use of the material for a reasonable time. On the contrary, the "conditional" construction permit issued to PRDC recites AEC's finding that:

"... the evidence submitted to date does not justify a finding with respect to the financial qualifications of PRDC."

20. AEC acted illegally, contrary to the provisions of Section 185 of the Atomic Energy Act, and contrary to the provisions of its own rules and regulations interpreting and implementing Section 185, in issuing to PRDC a "conditional" construction permit and in including in the permit an allocation of special nuclear material without the aforesaid requisite findings of "financial qualification."

21. The license application filed by PRDC reveals that PRDC's financial qualification is dependent upon the United States Government's acceding to three conditions laid down by PRDC: (a) statutory exemption of PRDC and its member companies from the provisions of the Public Utility Holding Company Act; (b) a ruling by the Internal Revenue Service that contributions of members to PRDC are deductible for federal income tax purposes; and (c) provision for adequate insurance protection against liability for damage claims arising from a catastrophe caused by its reactor. None of these three conditions had been met at the time the "conditional" construction permit was issued. AEC's issuance of the "conditional" construction permit under these circumstances was arbitrary, unreasonable, an abuse of discretion, and a violation of the applicable provisions of the statute and regulations.

22. One of the purposes of the Atomic Energy Act of 1954 is, as stated in Section 3(d) of said Act, to provide for:

"a program to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes *to the maximum extent consistent with the common defense and security and with the health and safety of the public.*" (Emphasis added.)

Numerous provisions of the Act impose an affirmative duty upon AEC to administer and regulate atomic energy developments in a manner which will assure the health and safety of the public. Thus, Section 104(b) of the Act, the Section under which the PRDC reactor will ultimately be licensed, refers to AEC's obligation under this Act "to protect the health and safety of the public."

23. AEC has constituted the Advisory Committee on Reactor Safeguards, consisting at the present time of fourteen eminent scientists and engineers, to assist it in the discharge of its aforesaid obligation to protect the health and safety of the

[6323]

public. Said Committee "... reviews safety studies referred to it by the Commission staff and advises the Commission with regard to the hazards of proposed or existing reactor facilities and the adequacy of proposed reactor safety standards."

24. In accordance with its policy of referring all applications for reactor licenses to the Advisory Committee for its review and recommendations, AEC referred the PRDC application to said Committee. On June 6, 1956, the Ad-

visory Committee submitted to the AEC its report on the PRDC reactor. The report has been suppressed by AEC in violation of the provisions of Section 146(b) of the Atomic Energy Act and Section 2.790, Title 10, CFR. Nevertheless, a member of AEC and members of the Joint Committee on Atomic Energy have publicly revealed excerpts from the Report which quote the Advisory Committee as finding "that there is insufficient information available at this time to give assurance that the PRDC can be operated at this site without public hazard;" that it is "doubtful" whether sufficient information to give assurance of safe operation of the reactor "will be available in time to give assurance of safe operation of this reactor unless the present fast reactor program of AEC is amplified and accelerated;" and that even such an accelerated program might not yield sufficient results to permit safe operation of the reactor at the Lagoona Beach site on the time schedule proposed by PRDC.

25. By a vote of three to one (the majority position being represented by two laymen and one scientist), AEC voted to issue the "conditional" construction permit in disregard of the findings of said Committee, and this action was arbitrary, unreasonable, capricious, and a violation of the Atomic Energy Act of 1954 and AEC's rules and regulations.

26. Section 185 of the Atomic Energy Act of 1954, quoted above, requires that a construction permit expire and all rights thereunder be forfeited if the facility is not completed by the latest date specified for completion in the license application, unless AEC "upon good cause shown" extends the completion date. AEC has incorporated in

the "conditional" construction permit issued to PRDC the date submitted by PRDC, December 15, 1960, as the latest date for completion of the reactor, despite AEC's finding that "there is some doubt" whether the safety problems can be resolved in time to meet the schedule proposed by PRDC. Similar doubts have been expressed in stronger form by the Advisory Committee on Reactor Safeguards, as described above. Issuance of the construction permit with the completion date of December 15, 1960, specified therein, despite these doubts, is in violation of Section 185 since it renders completely meaningless the statutory requirement that construction of reactors be completed within the time limitation specified in the construction permit.

[6324]

27. Section 104(d) of the Atomic Energy Act of 1954 provides that:

" . . . no license may be issued to any person within the United States if, in the opinion of the Commission, the issuance of a license to such person would be inimical . . . to the health and safety of the public."

28. Construction of a fast neutron breeder reactor, "the most hazardous of all reactors," with its inherent characteristics of instability and hazard, at a site near metropolitan population centers, before such a reactor has been constructed, tested, and experimentally proven in less populated areas, is inimical to the health and safety of the public. In issuing a "conditional" construction permit to PRDC under such circumstances, AEC violated said Section 104(d), and abused its discretionary authority thereunder.

29. The action of AEC in granting a "conditional" construction permit to PRDC on August 4, 1956, was irresponsible, precipitous, in flagrant violation of the Atomic Energy Act of 1954 and rules and regulations promulgated by the AEC and provides reasonable grounds for belief that when said facility is completed, after an expenditure of \$45,000,000, a license to operate will be issued without proper consideration of and regard for the health and safety of the public.

WHEREFORE, Intervenor^s pray that the Atomic Energy Commission:

- (1) grant their petition to intervene;
- (2) order immediate suspension of the "conditional" construction permit issued to Power Reactor Development Company pending a final determination of the questions raised herein;
- (3) set this matter for a formal hearing, in accordance with Part 2, Title 10, CFR, at the earliest possible date; and
- (4) rescind and declare a nullity the "conditional" construction permit issued to said Company until such time as there has been full compliance with all pertinent provisions of the statute, rules and regulations, and said Company has submitted information affording reasonable assurance that a reactor of the type contemplated can be built and operated at the site in question without undue risk to the health and safety of the public.

BENJAMIN C. SIGAL, General Counsel, IUE,
Attorney for Intervenor^s.

JAMES B. CAREY, AL HARTNETT,
JAMES DOUGLAS, and INTERNATIONAL
UNION OF ELECTRICAL, RADIO AND
MACHINE WORKERS, AFL-CIO,
1126 16th Street, N. W.,
Washington, D. C.

Dated: August 31, 1956.

[6325]

PROOF OF SERVICE

The foregoing Petition for Intervention and Request for Formal Hearing has been served upon the Power Reactor Development Company by mailing a true copy thereof, by Registered Mail, to the Power Reactor Development Company at 1100 Dime Building, Detroit 26, Michigan, this 31st day of August, 1956.

.....
Attorney for Intervenors

[6326]

BEFORE THE
UNITED STATES ATOMIC ENERGY COMMISSION
IN RE
LICENSE APPLICATION OF POWER REACTOR
DEVELOPMENT COMPANY

AEC Docket No. F-16

PETITION FOR INTERVENTION AND REQUEST FOR FORMAL HEARING

Now comes the International Union, United Paperworkers of America, affiliated with the American Federa-

tion of Labor-Congress, of Industrial Organizations, hereinafter referred to as UPA, Harry Sayre, President and a member of said UPA, Frank Grasso, Secretary-Treasurer and a member of said UPA, Max Van Wickle, President of Local 999, UPA, and a member of said UPA, Joseph Stanifer, President of Local 1000, UPA, and a member of said UPA, Lawrence Helten, President of Local 1003, UPA, and a member of said UPA, John Jennings, President of Local 1004, UPA, and a member of said UPA, and Frank Meade, Jr., President of Local 1006, UPA, and a member of said UPA, hereinafter referred to as Intervenors and file herewith their petition to intervene in these proceedings under the Commission's Rules of Practice, Section 2.705, Title 10, CFR, on behalf of themselves and on behalf of and as representatives of the members of said UPA similarly situated, on the following grounds to wit:

I. Intervenors state that said individual intervenor's Max Van Wickle, Joseph Stanifer, Lawrence Helten, John Jennings, Frank Meade, Jr. and the members of said UPA similarly situated reside, work and own property within an area approximately 10 miles of Lagoona Beach, Monroe County, Michigan, and that said Intervenors are residents of Monroe, Michigan. Intervenors

[6327]

further state that said Intervenor UPA is an unincorporated labor association composed of in excess of 60,000 members with principal offices at Washington, D. C.: that said UPA admits to membership employees employed in plants and shops engaged in the manufacture of paper and related products; that Harry Sayre is the duly elected President of UPA, that Frank Grasso is the duly elected

Secretary-Treasurer of UPA and that Max Van Wickle, Joseph Stanifer, Lawrence Helton, John Jennings and Frank Meade, Jr. are the duly elected Presidents of Locals 999, 1000, 1003, 1004 and 1006 respectively; that said Local 999, UPA is composed of 147 members, that Local 1000 is composed of in excess of 550 members, that Local 1003 is composed of in excess of 200 members, that Local 1004 is composed of in excess of 700 members and that said Local 1006 is composed of in excess of 150 members, all of whom are employed and reside in the vicinity of Monroe, Michigan; that the members of the said UPA similarly situated on whose behalf this action is brought constitute a class so numerous as to make it impractical to bring them all before the Atomic Energy Commission; that the Intervenor herein will fairly insure the adequate representation of all, and that there are common questions of law and fact effecting the rights of the Intervenor and said members of the UPA and that common relief is sought.

II. Intervenor further state that on or about August 4, 1956, the Atomic Energy Commission granted a "conditional" construction permit in these proceedings to the Power Reactor Development Company of Detroit, Michigan, hereinafter referred to as PRDC, for the construction of a fast neutron-breeder reactor more fully described in Report ADDA-108, designed to operate at 300,000 kw. equivalent of thermal

[6328]

energy and furnish approximately 100,000 kilowatts of electrical energy and which will use uranium enriched in the isotope uranium 235 as fuel; that the location specified for the construction of the facility is Lagoon Beach, Mon-

roe County, Michigan. The "conditional" construction permit also "allocated" to PRDC special nuclear material for operation of the reactor during the period of the license.

III. Intervenor further state that Lagoona Beach, Monroe County, Michigan, is located approximately thirty miles from the city of Detroit, Michigan and approximately seven and one-half miles from the city of Monroe, Michigan; that Monroe, Michigan has a population in excess of 21,000; Detroit, Michigan has a population in excess of 1,849,000; that within the cities of Detroit and Monroe and vicinity there is a large concentration of members of said UPA; that there are in excess of 1,000 members in the vicinity of the city of Detroit, and in excess of 2,000 members in the city of Monroe; that, in addition to the above-described areas, the UPA has many other members dwelling within an area which would be subject to the impact of an atomic catastrophe caused by said reactor.

IV. Intervenor further state that said members are employed in shops, factories and industrial establishments within said areas and that said UPA, together with its Locals, has collective bargaining agreements with employers in said shops, factories and industrial establishments; that said members own real estate and other property in said areas in excess of seven million dollars (\$7,000,000), and that the individual Intervenor own real estate and other property in said areas in excess of fifty thousand dollars (\$50,000).

[6329]

V. Intervenor further state that the action of the AEC in granting the conditional construction permit herein (1)

is a violation of the provisions of the Atomic Energy Act of 1954, and the regulations pursuant thereto adopted by the Commission, as more specifically set forth below; and (2) will result in the construction of a reactor which, under present technological conditions, is inherently unsafe, and which will thereby create a hazard which will place the individual Intervenors, the members of UPA and their families, in danger of an explosion or other incidents having the following effects:

(a) It would imperil and destroy the health and lives of said individual Intervenors, members, and their families.

(b) It would imperil and destroy the homes and other property in which said individual Intervenors and members have substantial investments.

(c) It would imperil and destroy the establishment at which said members are employed, and would result in a deprivation of facilities within said cities wherein said members earn a livelihood.

(d) It would depress the value of real estate and other property owned by said individual Intervenors, by said members, which might be affected by an atomic catastrophe.

(e) It would imperil the status of collective bargaining and would destroy the property rights of said UPA and its members in collective bargaining agreements with employers in said areas.

(f) It would contaminate the water supply of the city of Monroe endangering the health of the citizens and disabling the paper industry through a destruction of its essential water resource.

[6330]

VI. Intervenors further state that one of the principal functions of the UPA is to protect the health and safety of its members, particularly in their places of employment. In the performance of this function it seeks to obtain suitable provisions in collective bargaining agreements protecting the health and safety of covered employees. It engages in educational campaigns, providing its members with information essential to the protection of their health and safety. It seeks to obtain remedial legislation on local, state and national levels, promoting the health and safety of its members and all workers.

VII. Intervenors further state that the UPA has collective bargaining agreements with approximately fifteen employers within a hundred-mile radius of Monroe, Michigan. More than five thousand of its members are employed under the terms and provisions of said agreements within the plants located in said area. The existence of these plants as well as the safety of the employees working therein under contracts are placed in jeopardy by the aforesaid action of the Commission. The value of these contracts will be seriously impaired if the PRDC reactor is built in this area without reasonable assurances of safety.

VIII. Intervenors further state that the statutory standard for issuance of construction permits is established by Section 185 of the Atomic Energy Act of 1954, which provides as follows:

"Sec. 185. Construction Permits.—All Applicants for licenses to construct or modify production or utilization facilities shall, *if the application is otherwise ac-*

ceptable to the Commission, be initially granted a construction permit. The construction permit shall state the earliest and latest dates for the completion of the construction or

[6331]

modification. Unless the construction or modification of the facility is completed by the completion date, the construction permit shall expire, and all right thereunder be forfeited, unless upon good cause shown, the Commission extends the completion date. Upon the completion of the construction or modification of the facility, upon the filing of any additional information needed to bring the original application up to date, and upon finding that the facility authorized has been constructed and will operate in conformity with the application as amended and in conformity with the provisions of this Act and of the rules and regulations of the Commission, and in the absence of any good cause being shown to the Commission why the granting of a license would not be in accordance with the provisions of this Act, the Commission shall thereupon issue a license to the applicant. For all other purposes of this Act, a construction permit is deemed to be 'license.' ”
(Emphasis added.)

IX. Intervenors further state that the rules and regulations officially promulgated by the AEC establish the AEC's standards for implementing the statutory requirement that a construction permit shall be initially granted if the application is "otherwise acceptable to the Commission." Section 50.45, Title 10, CFR, provides as follows:

“Section 50.45 *Standards for Construction Permits*

“An applicant for a license or an amendment of a license who proposes to construct or alter a production or utilization facility will be initially granted a construction per, if the application is in conformity with and acceptable under the criteria of Sections 50.31 through 50.38 and the standards of Sections 50.40 through 50.43.” (Emphasis added.)

Intervenors allege, as hereinafter more fully set forth, that said PRDC's construction permit is not in conformity with and acceptable under the criteria of said Sections nor of the statutes made and provided.

X. Intervenors further state that Section 50.40 of the AEC's rules and regulations establishes standards which the application of PRDC must be “in consistency with and acceptable under.” Section 50.40 provides:

[6332]

“Section 50.40 *Common Standards*

“In determining that a license will be issued to an applicant, the Commission will be guided by the following considerations:

(a) The processes to be performed, the operating procedures, the facility and equipment, the use of the facility, and other technical specifications; or the proposals in regard to any of the foregoing collectively provide reasonable assurance that the applicant will comply with the regulations in this chapter, including the regulations in Part 20, and that the health and safety of the public will not be endangered.

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(b) The issuance of a license to the applicant will not, in the opinion of the Commission, be inimical to the common defense and security or to the health and safety of the public." (Emphasis added.)

XI. Intervenor further state that the AEC's rules and regulations, Section 50.35, Title 10, provide:

"Section 50.35. Extended Time for Providing Technical Information

"Where, because of the nature of a proposed project, an applicant is not in a position to supply initially all of the technical information otherwise required to complete the application, he shall indicate the reason, the items or kinds of information omitted, and the approximate times when such data will be produced. *If the Commission is satisfied that it has information sufficient to provide reasonable assurance that a facility of the general type proposed can be constructed and operated at the proposed location without undue risk to the health and safety of the public and that the omitted information will be supplied it may process the application and issue a construction permit on a provisional basis without the omitted information subject to its later production and an evaluation by the Commission that the final design provides reasonable assurance that the health and safety of the public will not be endangered.*" (Emphasis added.)

XII. Intervenor further state that the AEC did not make the finding requisite to the grant of a construction permit on a provisional basis under the aforesaid Section 50.35, i.e., that:

the Commission is satisfied that it has information sufficient to provide reasonable assurance that a facility of the general type proposed can be constructed and operated at the proposed location

[6333]

without undue risk to the health and safety of the public

The other construction permits issued to date on a provisional basis have included this finding.

XIII. Intervenors further state that the AEC has made findings, recited in the "conditional" construction permit issued to PRDC, which are inconsistent with and contrary to the finding of "reasonable assurance" required by said Section 50.35. The AEC has found that there are "identified areas of uncertainty" regarding the hazards potential of the type of reactor proposed by PRDC, and that "from the current state of the technology . . . it can reasonably be inferred that there may be other areas of uncertainty not yet identified."

XIV. Intervenors further state that the AEC acted illegally, contrary to the provisions of Section 185 of the Atomic Energy Act, and contrary to the provisions of its own rules and regulations interpreting and implementing Section 185, in issuing the "conditional" construction permit without making the required finding of "reasonable assurance."

XV. Intervenors further state that one of the purposes of the Atomic Energy Act of 1954 is, as stated in Section 3 (d) of said Act, to provide for:

"a program to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with the common defense and security and with the health and safety of the public."

Numerous provisions of the Act impose an affirmative duty upon the AEC to administer and regulate atomic energy developments in a manner which will assure the health and safety of the public. Thus, Section 104 (b) of the Act, the Section under which the PRDC reactor will ultimately be licensed, refers to the AEC's "obligation under this Act to protect the health and safety of the public."

[6334]

XVI. Intervenors further state that the AEC has constituted the Advisory Committee on Reactor Safeguards, consisting at the present time of fourteen eminent scientists and engineers, to assist it in the discharge of its aforesaid "obligation" to protect the health and safety of the public. Said Committee "... reviews safety studies referred to it by the Commission staff and advises the Commission with regard to the hazards of proposed or existing reactor facilities and the adequacy of proposed reactor safety standards.

XVII. Intervenors further state that the AEC, in accordance with its policy of referring all applications for reactor licenses to the Advisory Committee for its review and recommendations, referred the PRDC application to said Committee. On June 6, 1956, the Advisory Committee submitted to the AEC its report on the PRDC reactor. The report has been suppressed by the AEC in violation of the provisions of Section 146 (b) of the Atomic Energy

Act and Section 2.790, Title 40, CFR. Nevertheless, a member of the AEC and members of the Joint Committee on Atomic Energy have publicly revealed excerpts from the Report which quote the Advisory Committee as finding "that there is insufficient information available at this time to give assurance that the PRDC can be operated at this site without public hazard; "that it is doubtful" whether sufficient information to give assurance of safe operation of the reactor "will be available in time to give assurance of safe operation of this reactor unless the present fast reactor program of the AEC is amplified and accelerated;" and that even such an accelerated program might not yield sufficient results to permit safe operation of the reactor at the Lagoon Beach site on the time schedule proposed by PRDC.

[6335]

XVIII. Intervenor further state that Section 104 (d) of the Atomic Energy Act of 1954 provides that:

" . . . no license may be issued to any person within the United States if, in the opinion of the Commission, the issuance of a license to such person would be inimical . . . to the health and safety of the public." and that said Commission has an obligation under the Act to protect the health and safety of the public.

XIX. Intervenor further state that the action of the AEC in a "conditional" construction permit to PRDC on August 4, 1956, was in violation of the Atomic Energy Act of 1954 and rules and regulations promulgated by the AEC, and provides reasonable grounds for belief that a license to operate said facility when it is completed, with an ex-

penditure of \$45,000,000, will be issued without proper consideration of and regard for the health and safety of the public.

WHEREFORE, said Interveners pray that the Atomic Energy Commission:

- (1) grant their petition to intervene
- (2) order immediate suspension of the "conditional" construction permit issued to Power Reactor Development Company pending a final determination of the questions raised herein;
- (3) set this matter for a formal hearing, in accordance with Part 2, Title 10, CFR, at the earliest possible date, and
- (4) rescind and declare a nullity the "conditional" construction permit issued to said Company until such time as there has been full compliance with all pertinent provisions of the statute, rules, and regulation, and said Company has submitted information affording reasonable assurance that a reactor of the type contemplated can be built and operated at

[6336]

the site in question without undue risk to the health and safety of the public.

HARRY SAYRE,
International President United Pa-
perworkers of America., AFL-CIO
 1029 Vermont Ave., N.W., Wash., D.C.

FRANK GRASSO,

International Sec.-Treas. United Paperworkers of America. AFL-CIO
1029 Vermont Ave., N.W., Wash., D.C.

MAX VAN WICKLE,

President, Local 999, UPA
13660 Dunlap Rd., LaSalle, Michigan

JOSEPH STANIFER,

President, Local 1000, UPA
509 East 2nd St., Monroe, Michigan

LAWRENCE HELTEN,

Pres., Local 1003, UPA
827 Winston Drive, Monroe, Mich.

JOHN JENNINGS,

Pres., Local 1004, UPA
706 E. 1st St., Monroe, Mich.

FRANK MEADE, JR.,

Pres., Local 1006, UPA
220 West Elm Ave., Monroe, Mich.

The foregoing petition for intervention and request for formal hearing has been served upon the PRDC by mailing a true copy thereof, by Registered Mail, to the Power Reactor Development Company at 1100 Dime Building Detroit 26, Michigan, this 31st day of August, 1956.

HARRY SAYRE,

International President
UPA-AFL-CIO

[6340]

PRDC Answer to UAW Petition**UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION**

In The Matter Of**POWER REACTOR DEVELOPMENT COMPANY**

Docket No. F-16

ANSWER TO PETITION OF INTERNATIONAL UNION, UNITED PAPERWORKERS OF AMERICA, AFL-CIO, HARRY SAYRE, FRANK GRASSO, MAX VAN WICKLE, JOSEPH STANIFER, LAWRENCE HELTEN, JOHN JENNINGS AND FRANK MEADE, JR., INsofar AS SAID PETITION RELATES TO A REQUEST FOR LEAVE TO INTERVENE AND FOR SUSPENSION OF THE CONSTRUCTION PERMIT ISSUED TO POWER REACTOR DEVELOPMENT COMPANY ON AUGUST 4, 1956

and

MOTION TO STRIKE

NOW COMES Power Reactor Development Company, a non-profit corporation organized and existing under and by virtue of the laws of the State of Michigan, Applicant herein, and for answer to the Petition referred to above, insofar as the said Petition requests leave to intervene in these proceedings and insofar as said Petition requests

suspension of the Construction Permit issued Applicant on August 4, 1956, says as follows:

1. Applicant is unable to find warrant for intervention by these Petitioners in these proceedings in either the Atomic Energy Act of 1954, as amended, or in the Regulations promulgated thereunder, but Applicant is willing to leave the determination of the right of Petitioners to intervene to the decision of the Commission.

2. The Applicant is willing at any time in a proper hearing to present evidence on the merits and submit to the Commissioner the

[6341]

determination of Applicant's right to retain the Construction Permit which has been hitherto issued to Applicant.

3. The prayer of said Petition that the Construction Permit issued to Applicant be suspended pending the final determination of questions raised by the Petition to Intervene should be denied for the following reasons:

a) The grant of such prayer would be tantamount to granting the relief requested by the Petition, i.e., the revocation of the Construction Permit without a prior hearing.

b) The grant of such request would unreasonably delay Applicant in proceeding with essential research and other plans for the construction of the reactor plant and would interfere with the policy of the United States in expediting the development of atomic energy for peaceful purposes.

c) Refusal to grant such request can have no conceivable effect upon the health or safety of the public as

the activities in which Applicant is presently engaged under the authority of the Construction Permit are related solely to preparation of the construction site, design and procurement of mechanical components of the proposed reactor plant and continued research. No fissionable materials are employed by Applicant at the construction site, and none will be so employed until Applicant is granted a license to operate the reactor plant, which will not be earlier than December 1, 1959. Therefore, the present activities of the Applicant cannot possibly create hazard to the health or safety of the public.

d) The Atomic Energy Commission issued the Construction Permit to Applicant after full consideration of the Application for License submitted by Applicant, and no showing is made by the Petition for Intervention which would warrant suspension or revocation of the said

[6342]

Construction Permit without a prior hearing, and the action of the Atomic Energy Commission in issuing the said Construction Permit must be deemed proper until and unless a showing is made in open hearing to the contrary.

e) The grant of such request would be contrary to the provisions of Section 2.200 *et seq.*, Title 10, C.F.R., of the Regulations promulgated by the Atomic Energy Commission, which provide the procedure to be followed in connection with the revocation, suspension, modification and amendment of licenses and construction permits and which provide that the permit holder be given an opportunity to demonstrate or achieve compliance with require-

ments of the Atomic Energy Commission where conditions or conduct are claimed to exist which, if they did exist, would warrant revocation, suspension, modification or amendment of a license or permit, and which provide further that the Atomic Energy Commission shall give notice prior to the institution of any proceeding for the revocation, suspension, modification or amendment of a permit. The Commission has established a requirement that a hearing be had before a construction permit can be suspended, and no showing has been made by Petitioners that any emergency action within the contemplation of the Rules and Regulations of the Atomic Energy Commission is required.

4. Applicant denies that the reactor plant proposed by Applicant would cause any atomic catastrophe or create any hazard which would place any of the Intervenor in danger of explosion or other incident which would imperil health, life or property. Applicant asserts that the Atomic Energy Commission has in all respects acted properly within its authority and in the interest of the health and safety of the public in connection with these proceedings.

5. Applicant hereby moves the Atomic Energy Commission

[6343]

to order that all reference to suppression of the report of the Advisory Committee on Reactor Safeguards be stricken from the Petition. The Advisory Committee on Reactor Safeguards is not created by statute, nor is it created by the Atomic Energy Commission as a separate Advisory Board pursuant to any statutory authority, and reference

to the said report or the internal method of handling the same within the Commission is not relevant to these proceedings.

WHEREFORE, Applicant prays that the Atomic Energy Commission

1. Determine whether or not Intervenor have a right to intervene in these proceedings.

2. That if such determination is made favorable to Intervenor, a hearing officer be promptly appointed and this matter be promptly set for formal hearing upon those matters properly raised by the Petition to Intervene and Applicant be given an opportunity to fully answer each allegation made in the said Petition.

3. Deny the request of the Petition to Intervene that the Construction Permit be suspended pending determination of the questions raised by the said Petition.

4. Order all reference to "suppression" of the report of the Advisory Committee on Reactor Safeguards stricken from the said Petition.

MILLEN CANFIELD, PADDOCK AND
STONE

By EDWARD S. REID, JR.
Edward S. Reid, Jr.

And RICHARD B. GUSHEE
Richard B. Gushee
Attorneys for Power Reactor Development Company
3456 Penobscot Building
Detroit 26, Michigan
Woodward 3-6420

[6358]

**Notice of Hearing, Order and Memorandum,
October 8, 1956**

**UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION**

**In the Matter of
POWER REACTOR DEVELOPMENT COMPANY.**

**Docket No. F-16.
Notice of Hearing, Order and Memorandum.**

At a session of the Atomic Energy Commission held in Washington, D. C., on the 8th of October, 1956, Chairman Lewis L. Strauss and Commissioners Willard F. Libby, Thomas E. Murray, and Harold S. Vance present, it appeared that:

On January 7, 1956, Power Reactor Development Company (hereinafter called "the applicant") filed its application for a construction permit, under Section 104b. of the Atomic Energy Act of 1954, to build a nuclear reactor. Amendments to the application were filed on June 6, July 12, July 20 and July 23, 1956. On August 4, 1956, the Commission issued a provisional construction permit (CPPR-4) under section 50.35 of its regulations (10 CFR 50.35) authorizing construction of said reactor subject to certain conditions.

Petitions for leave to intervene and further relief were filed on August 31, 1956, on behalf of the International

Union, United Automobile, Aircraft and Agricultural Implement Workers of America, AFL-CIO, Walter P. Reuther, Emil Mazey and Carlos Gastambide; on behalf of the International Union of Electrical, Radio and Machine Workers, AFL-CIO; James B. Carey, Al Hartnett and James Douglas; and on behalf of the International Union, United Paperworkers of America, AFL-CIO, Harry Sayre, Frank Grasso, Max Van Wickle, Joseph Stanifer, Lawrence Helten, John Jennings, and Frank Meade, Jr.:

On September 14, 1956, the applicant filed answering papers to said petition insofar as they request leave to intervene and suspension of said construction permit pending a final determination of the

[6359]

matters raised by said petitions, and the applicant moved that the Commission strike certain statements from said petitions; and

On September 19 and 20, 1956, petitioners filed additional statements in opposition.

Upon due consideration of the foregoing, and in light of the considerations expressed in the annexed memoranda of the Commissioners,

It is Ordered That:

(1) The petitions for leave to intervene filed on behalf of the above named petitioners are granted and said interveners are made parties to the hearing ordered herein;

(2) Pursuant to Section 189 of the Atomic Energy Act of 1954 and the Commission's regulations, a hearing shall

be held on said application upon the following Specification of Issues:

A. 1. Whether there is information sufficient to provide reasonable assurance that a utilization facility of the general type proposed in the application can be constructed and operated at the location proposed therein without undue risk to the health and safety of the public.

2. Whether there is reasonable assurance that technical information omitted from and required to complete the application will be supplied.

B. Whether, pursuant to Section 50.40(b) of the Commission's regulations, the applicant is financially qualified to engage in the proposed activities; and whether, pursuant to Section 50.60(e)(2) of the Commission's regulations, the applicant is financially qualified to receive an allocation of special nuclear material.

[6360]

C. With respect to any matter in controversy in this proceeding, whether the Commission may, or should, grant any exemption pursuant to Section 50.12 of its regulations on the ground that such exemption is "authorized by law and will not endanger life or property or the common defense and security and . . . [is] otherwise in the public interest."

D. If the issues in the proceeding are resolved in favor of continuing the construction permit, what additional or different provisions, if any, should be incorporated in it.

(3) Jay A. Kyle, Esq., is designated as the presiding officer to conduct the hearing. The hearing shall commence on November 13, 1956, in Washington, D. C., at the offices of the Commission or on such adjourned date or at such other place as may be directed by the presiding officer. Pursuant to Section 2.751(b) of the Commissioner's regulations, the presiding officer at the conclusion of the hearing shall, without rendering an intermediate decision, certify the record of the hearing to the Commission.

(4) The interveners' requests for an immediate suspension of said construction permit pending the final determination of the matters raised by said petitions are denied without prejudice to ultimate determination by the Commission as to whether the permit should be continued, modified or vacated.

(5) On or before October 22, 1956, the applicant and the interveners shall file and serve their answers pursuant to Section 2.736 of the Commission's regulations.

(6) A copy of the letter dated June 6, 1956, from C. Rogers McCullough, Chairman, Advisory Committee on Reactor Safeguards, to the General Manager shall be sent to each of the interveners and placed in the Commission's public document room.

[6361]

(7) Papers required to be filed with AEC in this proceeding shall be filed with the Secretary, Atomic Energy Commission, 1901 Constitution Avenue, N. W., Washington 25, D. C. Pending further order of the presiding officer, the parties shall file ten copies of each such paper with

AEC and where service of papers is required on other parties shall serve five copies on each.

ATOMIC ENERGY COMMISSION

By WOODFORD B. MCCOOL

Secretary

Dated: October 8, 1956

(SEAL)

[6362]

MEMORANDUM OF THE COMMISSION

1. The provisional construction permit was issued on August 4, 1956. Attached hereto is a copy of the letter of August 4, 1956, to the Company forwarding the permit. On August 31, 1956, which was within 30 days thereof, the petitioners made their request for leave to intervene and for further relief.

2. The allegations of the petitioners purporting to show their interest in the proceeding are not controverted by the applicant. *Prima facie*, these allegations provide a basis for the granting of leave to intervene in the proceedings before the Commission. Administrative agencies may permit persons to intervene even though their interest may not be such as to entitle them to judicial review.

3. Section 2.102 of the Commission's rules of practice provides:

"(a) The AEC will, upon request of the applicant or an intervener, and may upon its own initiative, direct the holding of a formal hearing prior to taking

action on the application. If no prior formal hearing has been held and no notice of proposed action has been served as provided in paragraph (b) of this section, AEC will direct the holding of a formal hearing upon receipt of a request therefor from the applicant or an intervenor within 30 days after the issuance of a license or other approval or a notice of denial.

“(b) In such cases as it deems appropriate, AEC may cause to be served upon the applicant, and published, a notice of proposed action upon his application and shall cause copies thereof to be served upon intervenors or others entitled to or requesting notification. The notice shall state the terms of the proposed action. If a formal hearing has not been held prior to issuance of the notice, AEC will direct the holding of a formal hearing upon the request of the applicant or an intervenor received within fifteen days following the service of the notice.”

[6363]

4. The intervenors' request for hearing was filed within the time specified in our rules. Accordingly, the application for a construction permit is being set down for hearing and referred to a hearing examiner to conduct a formal hearing.

5. In adopting Section 2.102 the Commission established alternative procedures with respect to the issuance of permits and licenses. Under the section, the Commission may order a prior hearing before taking action; or issue a notice of proposed construction permit or license allowing 15 days thereafter for filing requests for hearing;

or, as was done in the present proceeding, may issue a permit or license subject to the receipt within 30 days of a proper request for hearing from the applicant or an intervenor. Whichever course is followed, the proceeding is not complete until the opportunities for hearing have expired, or if a hearing has been properly requested and allowed, such hearing has been held and the issues determined.

6. Since a proper and timely request for hearing has been made and allowed in this proceeding, the applicant for the permit must demonstrate at the hearing that it is able to satisfy those requirements of law and the Commission's regulations which are in controversy. For this reason, certain collateral matters raised by the interveners' petitions (such as their references to the phraseology of the construction permit) do not require consideration at this time.

7. Applicant's motion to strike certain allegations from the petitions raises questions of an evidentiary nature which are being left for determination during the hearing.

8. Since the permit does not authorize the applicant to possess or use any special nuclear or radioactive material and since activities authorized by the construction permit do not create nuclear hazards during the period of construction, the interveners' request for suspension of the construction permit pending

[6364]

the hearing is being denied, without prejudice to ultimate determination by the Commission as to whether the permit should be continued, modified or vacated.

9. The order contains a provision directing that copies of the report dated June 6, 1956, from C. Rogers McCullough, Chairman of the Advisory Committee on Reactor Safeguards, to K. E. Fields, General Manager, be sent to the interveners and placed in the Commission's Public Documents Room. This action is being taken because a copy of the Advisory Committee's report was sent to the Power Reactor Development Company on June 18, 1956, in connection with discussions between the AEC staff and representatives of the company. The Commission has concluded that the public interest would best be served in this instance by making the document available to the interveners and the public.

By LEWIS L. STRAUSS
Chairman

By WILLARD F. LIBBY
Commissioner

By HAROLD S. VANCE
Commissioner

[6365]

August 4, 1956

Power Reactor Development Company
1911 First Street
Detroit 26, Michigan

Gentlemen:

Enclosed is a construction permit issued by the Atomic Energy Commission authorizing Power Reactor Develop-

ment Company to construct the utilization facility described therein.

The issuance of this permit is based on the information and representations contained in your original application filed on January 7, 1956, and amendments thereto filed on June 6, 1956, July 12, 1956, July 20, 1956, and July 23, 1956, including PRDC's program for carrying out further, investigation and experiments leading to the final design of the proposed reactor.

As specified in the construction permit, ~~prior to taking action on the conversion of the construction permit to a license to operate the facility a final Hazards Summary Report must be submitted to AEC for evaluation and a determination that the reactor can, in fact, be operated without undue risk to the health and safety of the public.~~

As stated in the construction permit the Commission believes that the safety problems associated with the reactor will prove to be of a kind which can be resolved within a reasonable time. The Commission regards the fast breeder program as a very important program and will use its best efforts to assist the company to resolve these problems as completely and as quickly as possible. However, the Commission wants it to be clearly understood that in issuing this construction permit the emphasis is on the fact that it is a conditional one and that the Commission can make no commitment to convert the permit to a license until it is satisfied on all safety matters.

Also, as you are aware, PRDC has not submitted to date sufficient information for the Commission to make a finding with respect to financial qualifications. Paragraph 3d of

the permit contains a condition that its continued effectiveness will be dependent upon a showing within 12 months by

[6366]

PRDC that its financial resources are such as to enable the Commission to make the required finding, unless for good cause shown the Commission extends the time for submission of such data.

You will observe that the final paragraph of this permit establishes an allocation of 3.929 kilograms of contained U-235 for use in connection with the operation of this facility. This allocation represents the quantity of U-235 estimated to be required for burn-up and losses, plus inventory. You will also observe that shipments of U-235 by the Commission to PRDC in accordance with Schedule 1 of the Appendix to the permit will be conditioned upon PRDC's return to the Commission of material subsequently in accordance with schedule 2 of the Appendix. The issuance of this permit and the allocation of U-235 contained therein is not to be construed as a commitment by the Commission to supply the U-235 in any form except UF₆.

The issuance of this permit does not constitute a commitment on the part of the Commission to provide transportation or processing services with respect to the spent fuel.

Pursuant to established Commission policy, the Commission will undertake to supply PRDC's Boron-10 requirements, under appropriate terms and conditions and within the limitations of available supply, until such time as Boron-10 is available from a commercial source of supply.

An allocation of source material in the form of depleted uranium is not being made at this time pending completion of a study of the classification of this material.

Please communicate with us in the event you have any questions concerning any of the provisions of the construction permit.

Sincerely yours,

/s/ H. L. PRICE

Director, Division of Civilian Application

Enclosure

[6367]

OPINION OF COMMISSIONER MURRAY DISSENT IN PART

On August 2, 1956, the majority of the Commission authorized the issuance of a conditional construction permit to the Power Reactor Development Company. I did not concur with the majority because the information then before the Commission in my opinion was insufficient to provide reasonable assurance that a facility of the general type proposed could be constructed and operated at the proposed location without undue risk to the health and safety of the public. In this connection, I placed my principal reliance on a letter dated June 6, 1956 (a copy of which is attached) from the Advisory Committee on Reactor Safeguards, signed by C. Rogers McCullough, Chairman of the Committee.

As late as September 28, 1956, the Commission was informed that the Advisory Committee on Reactor Safe-

guards has not changed its position in respect to its letter of June 6th and also that there was no new information. Under these circumstances I am of the opinion that this permit should be suspended pending conclusion of the hearing in this matter.

In other respects I concur in the decision of the majority of the Commission.

✓ By THOMAS E. MURRAY
Commissioner

[6368]

June 6, 1956

Mr. K. E. Fields
General Manager
U. S. Atomic Energy Commission
Washington 25, D. C.

SUBJECT: Power Reactor Development Company
(Atomic Power Development Associates)
Fast Power Reactor
(Reports APDA 108 and 114)*

Dear Mr. Fields:

The present status of the reactor being proposed by the Power Reactor Development Company, associated with Atomic Power Development Associates, was reviewed by the Advisory Committee on Reactor Safeguards at its Eighteenth Meeting on June 3, 1956. This review included the design of the reactor, the state of information on the nuclear properties and the relation of the reactor to its

containment and its site. The proposed PRDC reactor represents a greater step beyond the existing state of the art than any other reactor of comparable power level which has been proposed by an industrial group.

From this review the following conclusions were derived:

1. Even though there are no facts or calculations available to the Committee that clearly indicate that the proposed reactor is not safe for this site, the Committee believes there is insufficient information available at this time to give assurance that the PRDC reactor can be operated at this site without public hazard.

2. It appears doubtful that sufficient experimental information will be available in time to give assurance of safe operation of this reactor unless the present fast reactor program of the AEC is amplified and accelerated as detailed below.

[6369]

3. It is impossible to say whether or not an accelerated program would give sufficient information to permit safe operation of this reactor at the Lagoon Beach site on the time schedule presently proposed.

The following program of investigation is suggested in order to provide information to judge the safety of the proposed operation.

1. The origin of the positive component of the temperature coefficient in EBR-I must be established. A clear demonstration must be given that a coefficient of this magnitude cannot exist in the PRDC design.

The experimental program required would involve three phases:

a. Study of the spontaneous behavior of a new EBR-I core designed with rigid fuel elements to insure against the possibility of bowing. Such a study might have to include experiments with both series and parallel flow through core and blanket.

b. Extensive studies of oscillator experiments on the PRDC design with a simulator, using a wide variety of component temperature coefficients and associated time constants. These studies should be designed to demonstrate that oscillator tests in the startup of the PRDC reactor can produce all the temperature coefficient information required to assure safe transient properties of the reactor, i.e., a negative prompt temperature coefficient of sufficient magnitude to prevent a fuel melt-down.

c. Further experimental work on ZPR-III to show the magnitude and size of the Doppler effect in order to verify the theory.

[6370]

together with a reasonably complete theoretical understanding of their origin in terms of the mechanical design. This program has three aspects:

a. A demonstration by the simulator studies under 1b.—that the proposed startup program on PRDC can give the information required over a wide range of possible coefficients and time constants.

b. Conduct of oscillator studies on the EBR-II reactor to show that they are feasible and capable of being interpreted to give the necessary information.

c. Startup program on the PRDC reactor itself to obtain the final information needed before the reactor can be safely operated at full power without meteorological restrictions.

The objective of this program must be to ascertain whether the various negative coefficients are sufficient to prevent meltdown under any conceivable circumstances of control mal-operation.

3. The Committee as a whole was not satisfied with the evidence presented that no credible supercriticality accident resulting from meltdown could breach the container. It is felt that a more extensive theoretical and experimental program to examine all the possibilities needs to be established and pursued vigorously. The following are examples: mechanical mock-up studies designed to study distortion of core on sudden melting, criticality studies in ZPR-III design to investigate maximum supercritical arrangements, detailed design studies of the reactor structure, with supporting mock-up experiments, to insure sub-critical distribution of melted fuel and to assure that free fall of core parts cannot re-assemble a critical mass suddenly.

[6371]

4. It is considered critically important that the EBR-II program be pursued more aggressively and

coordinated more closely with the PRDC design than is presently the case. The EBR-II program is the only program now constituted which could provide engineering information and operating experience on a high-power-density fast reactor in advance of the scheduled date for operation of the PRDC reactor.

The nature and content of the EBR-II program which the Committee considers essential depends on the outcome of investigation 3 above. If it can be shown that a supercritical accident with sufficient energy release to breach the building cannot take place, then the EBR-II program should be aimed at providing general engineering information relevant to the economical design and safe operation of the PRDC reactor.

On the other hand, if it cannot be shown that breaching of the building during a meltdown is impossible, then a much more extensive EBR-II program is required. The test reactor to be operated as EBR-II should then be a genuine prototype of the PRDC reactor. The fuel elements of the test reactor should be identical in all essentials to those proposed for the PRDC reactor, and operated at power densities at least as high as those to be used in the PRDC reactor. The static and dynamic properties of the test reactor should be fully investigated, completely understood theoretically and proved incapable of causing meltdown. These properties should be investigated both for the reactor with its initial charge of U-235 and U-238 and for the

reactor with the steady-state concentration of plutonium in the core.

5. The program should not be limited to the above points but should be broadened to

[6372]

whatever extent may be shown necessary by the program itself.

The Committee wishes to note that the experience that now exists on fast power reactors of high power density is not wholly reassuring. While the EBR-I incident is not directly relevant in this connection because the reactor was known to possess an unstable prompt power coefficient under the conditions of the terminal experiment, nevertheless the fact remains that the origin of this unstable coefficient has not been clearly established and therefore its possible occurrence in the PRDC design cannot be definitely excluded on the basis of present experimental information. Opinions differ as to whether its absence can be completely assured in a safe way by the oscillator tests in the pre-startup program proposed for the PRDC reactor *in situ*.

The Committee considers it important that bold steps be taken to advance the development of the fast breeder reactor concept and commends the willingness of the Power Reactor Development Company to risk its capital and prestige in advancing the development of this reactor concept. But the Committee does not feel that the steps to be taken should be so bold as to risk the health and safety of

the public. It is important for the AEC to provide sufficient development facilities and experimental information that the safety aspects of the PRDC reactor can be reliably appraised in advance of operation of the reactor itself.

Sincerely yours,

/s/ C. ROGERS McCULLOUGH

C. ROGERS McCULLOUGH

Chairman

Advisory Committee on Reactor

Safeguards

* APDA-108 Description of Developmental Fast Neutron Breeder Power Reactor Plant, Sept. 1, 1955.

[6386]

Intervenors' Answer to Order of Commission

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

In the Matter

of

**LICENSE APPLICATION OF POWER REACTOR
DEVELOPMENT COMPANY.**

AEC Docket No. F-16.

ANSWER OF INTERVENORS

NOW COME the International Union, United Automobile, Aircraft and Agricultural Implement Workers of

America, AFL-CIO, Walter P. Reuther, Emil Mazey, and Carlos Gastambide, *et al.*; the International Union of Electrical, Radio and Machine Workers, AFL-CIO, James B. Carey Al Hartnett and James Douglas, *et al.*; the International Union, United Paperworkers of America, AFL-CIO, Harry Sayre, Frank Grasso, Max Van Wickle, Joseph Stanifer, Lawrence Helten, John Jennings, and Frank Meade, Jr., *et al.*, hereinafter referred to as Intervenor and for answer to the Order of the Atomic Energy Commission (hereinafter referred to as Commission or AEC) dated October 8, 1956, state as follows:

1. With respect to the issue denominated as A (1) in the Commission's Order of October 8, 1956, the Intervenor deny that there is information sufficient to provide reasonable assurance that a utilization facility of the general type proposed in the application can be constructed and operated at the location proposed therein without undue risk to the health and safety of the public.

2. With respect to the issue denominated as A (2) in the Commission's Order of October 8, 1956, the Intervenor deny that there is reasonable assurance that technical information omitted from and required to complete the application will be supplied by PRDC in a form justifying issuance of any construction permit.

3. The Atomic Energy Act of 1954, hereinafter referred to as Act, prohibits construction of a utilization facility except pursuant to a construction permit, and Section 50.35 of the Commission's regulations requires a finding by AEC that there is

"reasonable assurance that a facility of the general type proposed can be constructed and operated at the

proposed location without undue risk to the health and safety of the public * * * as a prerequisite to issuance of a construction permit on a provisional basis.

[6387]

4. At the time AEC issued the "conditional" construction permit to PRDC on August 4, 1956, PRDC had not submitted sufficient information to AEC to provide such "reasonable assurance".

5. AEC's issuance of the "conditional" construction permit on August 4, 1956, was arbitrary, erroneous, and contrary to law since the required finding of "reasonable assurance" had not been made, and the findings which AEC did make, i.e., that there existed "identified" and "unidentified" "areas of uncertainty" regarding the hazards potential of the type of reactor proposed by PRDC, were inconsistent with, contrary to, and precluded the required finding of "reasonable assurance".

6. With respect to the issue denominated as B in the Commission's Order of October 8, 1956, the Intervenor deny that the applicant is financially qualified to engage in the proposed activities pursuant to Section 50.40 (b) of the Commission's regulations, and deny that the applicant is financially qualified to receive an allocation of special nuclear material pursuant to Section 50.60 (c)(2) of the Commission's regulations.

7. The Act and Sections 50.40 [REDACTED] and 50.45, Title 10, CFR, require the AEC find, as a condition of issuing a construction permit on any basis, that the applicant is

"financially qualified to engage in the proposed activities" in accordance with AEC regulations.

8. Section 50.60, Title 10, CFR, requires that before AEC includes in a construction permit any allocation of special nuclear material it must find that:

"The applicant appears to be financially qualified to assume responsibility for the payment of Commission charges for the material and to undertake and carry out the proposed use of special nuclear material for a reasonable period of time * * *

9. At the time AEC issued the "conditional" construction permit to PRDC on August 4, 1956, PRDC had not established its financial qualifications, and AEC itself stated in the "conditional" construction permit that:

"* * * the evidence submitted to date does not justify a finding with respect to the financial qualifications of PRDC."

10. The license application filed by PRDC indicates that PRDC has made its financial qualification dependent upon: (a) statutory exemption of PRDC and its member companies from the provisions of the Public Utility Holding Company Act; (b) a ruling by the Internal Revenue Service that contributions by its members to PRDC are deductible for federal income tax purposes; and (c) provisions for adequate

[6388]

insurance protection against liability for damage claims arising from a catastrophe caused by its reactor. None of these three conditions had been met at the time the

"conditional" construction permit was issued, and none of them has been met at the present time. In addition, PRDC's financial qualification is dependent upon execution of a contract for AEC financial assistance under the Power Demonstration Reactor Program, and execution of this contract is in turn dependent upon the United States Government's acceding to the aforesaid three conditions.

11. AEC acted illegally, contrary to the provisions of the Act, and contrary to the provisions of its own rules and regulations, in issuing to PRDC a "conditional" construction permit and in including in the permit an allocation of special nuclear material without the aforesaid requisite findings of "financial qualification".

12. With respect to the issue denominated as C in the Commission's Order of October 8, 1956, the Intervenor's oppose the granting of a specific exemption to PRDC pursuant to Section 50.12 of the Commission's regulations.

13. The specific exemption contemplated in Section 50.12, Title 10, CFR, may be granted only "upon application by any interested person". Neither PRDC nor any other person has requested such a specific exemption under Section 50.12.

14. Section 50.12, Title 10, CFR is invalid insofar as it is applicable to construction permits issued under Section 104 (b) of the Act. If it is a valid regulation under the provisions of the Act, it does not permit granting of an exemption to PRDC as a result of which any construction permit could issue to PRDC.

15. Any specific exemption from the requirement of AEC's rules and regulations relating to the necessity for

a finding of "reasonable assurance" as set forth in paragraph 3 hereof, or for a finding of "financial qualification" as set forth in paragraphs 7 and 8 hereof, would be contrary to law.

16. A specific exemption from the requirements of AEC's rules and regulations relating to the necessity for a finding of "reasonable assurance", as set forth in paragraph 3 hereof, or for establishment of and a finding of "financial qualification", as set forth in paragraphs 7 and 8 hereof, would be inimical to the health and safety of the public and would be contrary to the public interest.

[6389]

17. Under Section 3 (d) of the Act, peaceful applications of atomic energy must be "consistent * * * with the health and safety of the public", and Section 104 (d) prohibits the issuance of a construction permit when issuance "would be inimical * * * to the health and safety of the public". In the present state of the art of fast breeder reactors, this type of reactor is "the most hazardous of all reactors", and such a reactor should not be constructed near metropolitan population centers until it or a prototype has been constructed, tested, and experimentally proven at a location distant from population centers. In permitting construction of this reactor at the Lagoon Beach site at this time, AEC has violated the Atomic Energy Act of 1954, and its own rules and regulations.

18. PRDC was influenced by AEC or its representatives to undertake precipitously a program for construction of its fast breeder reactor, prior to resolution of safety hazards known to exist and prior to establishment

of the financial qualifications of PRDC. Such action by AEC or its representatives, as well as their public utterances on this matter, had a strong tendency to affect the Commission's judgment in acting on the license application of PRDC.

19. With respect to the issue denominated as D in the Commission's Order of October 8, 1956, the Intervenor states that no modification of or amendments to the "conditional" construction permit of August 4, 1956, can remedy the serious hazards to the health and safety of the public which would be occasioned by operation of the PRDC reactor at the Lagoona Beach site under present and presently foreseeable technological conditions.

20. The Intervenor reserves the right to take a position at a future date on any modification of or amendments to the "conditional" construction permit which may be proposed.

21. Intervenor will appear at the hearing ordered by the Commission and will present evidence and argument in support of the foregoing allegations.

[6390]

22. The Intervenor prays that the AEC rescind and declare a nullity the "conditional" construction permit issued to PRDC until such time as there has been full compliance with all pertinent provisions of the Atomic Energy Act of 1954 and the Commission's rules and regulations.

HAROLD A. CRANEFIELD

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BENJAMIN C. SIGAL

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HAROLD P. GREEN

.....
LOWELL GOERLICH
Attorneys for Intervenors.

October 19, 1956

[6392]

PRDC Answer to Order of Commission

**UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION**

In the Matter
of

POWER REACTOR DEVELOPMENT COMPANY.

Docket No. F-16.

**ANSWER OF POWER REACTOR DEVELOPMENT
COMPANY TO NOTICE OF HEARING AND ORDER**

NOW COMES Power Reactor Development Company,
a non-profit corporation organized and existing under and
by virtue of the laws of the State of Michigan, and for
answer to the specification of issues set forth in the certain

Notice of Hearing and Order of the Atomic Energy Commission dated October 8, 1956, says as follows:

1. There is sufficient information to provide reasonable assurance that a utilization facility of the general type proposed in the Application dated January 7, 1956, as amended, submitted by Power Reactor Development Company to the Atomic Energy Commission can be constructed and operated in the location proposed in the said application without undue risk to the health and safety of the public.

2. There is reasonable assurance that technical information omitted from the said Application, and which is required to be filed to complete the said Application, will be supplied.

3. Power Reactor Development Company is financially qualified to engage in the activities proposed by the said Application and is financially qualified to receive an allocation of special nuclear materials.

[6393]

4. The Atomic Energy Commission is authorized to, and should, grant to Power Reactor Development Company such exemptions from the requirements of the Regulations of Part 50, Title 10, C. F. R., with respect to any matter in issue in these proceedings as will not endanger life or property or the common defense and security and as may appear necessary to enable Power Reactor Development Company to proceed with the design and construction of the utilization facility proposed in the said Application as the development and construction of the proposed facility is of paramount importance to implementation

of the public and national interest in the development of peaceful uses of atomic energy.

5. The grant of exemption from provisions of the Regulations of Part 50, Title 10, C. F. R., by the Atomic Energy Commission to Power Reactor Development Company in respect of matters which will not endanger life or property or the common defense and security is clearly warranted by the policy of the Power Demonstration Reactor Program of the said Commission and by Section 104(b) of the Atomic Energy Act of 1954, as amended, which provides for the issuance of licenses (construction permits), subject to the minimum amount of regulations and conditions compatible with the protection of the health and safety of the public.

6. The issuance by the Atomic Energy Commission of a construction permit for the construction of a utilization facility of the general type proposed by Power Reactor Development Company in the aforesaid Application, as amended, is not a violation of any provision of the Atomic Energy Act of 1954, or of the Regulations promulgated pursuant thereto by the said Commission, nor does issuance of such

[6394]

construction permit create a hazard to the health and safety of the public or to property.

7. The Regulations of the Atomic Energy Commission, which provide for the conversion of a construction permit to an operating license, to wit, Sections 50, 56, Title 10, C. F. R., amply protect the interest of the public health and safety by conditioning such conversion upon comple-

tion of construction in compliance with the terms and conditions of the construction permit as it may be amended from time to time and upon the conduct of tests in connection with assuring the health and safety of the public. All construction permits are, therefore, provisional and all holders of such permits are subject to the possibility that an operating license will not issue after completion of construction of the facility.

8. The provisions of the Atomic Energy Act do not require of the Atomic Energy Commission that it find that the health and safety of the public be assured in order to grant a construction permit but do require, and properly so, that such a finding be made before a facility can be operated.

9. Power Reactor Development Company will appear at the hearing set by the Atomic Energy Commission and present evidence upon the matters at issue.

WHEREFORE, Power Reactor Development Company prays that the Atomic Energy Commission

1. Determine that there is sufficient information to provide reasonable assurance that a utilization facility of the general type proposed by Power Reactor Development Company can be constructed and operated in the location proposed without undue risk to the health and

[6395]

safety to the public.

2. Determine that there is reasonable assurance that technical information omitted from the Application, as

amended, heretofore, filed by Power Reactor Development Company and which is required to be filed to complete said Application, will be supplied.

3. Determine that Power Reactor Development Company is financially qualified to engage in the activities proposed by the said Application and is financially qualified to receive an allocation of special nuclear materials.

4. Grant to Power Reactor Development Company such exemptions as will not endanger life or property or the common defense and security from the requirements of the Regulations of Part 50, Title 10, C. F. R., as may appear necessary to enable Power Reactor Development Company to proceed with the design and construction of the utilization facility proposed in the said Application.

5. Continue in effect the construction permit heretofore issued to Power Reactor Development Company with such additional or different provisions and/or conditions which the Commission may deem to be necessary in the public interest.

MILLER, CANFIELD, PADDOCK
AND STONE

By /s/ EDWARD S. REID, JR.
Edward S. Reid, Jr.

And /s/ RICHARD B. GUSHEE
Richard B. Gushee
*Attorneys for Power Reactor
Development Company*
3456 Penobscot Building
Detroit 26, Michigan
Woodward 3-6420

[6660]

**Commission's Order Extending Time for Submission
of Financial Information, August 8, 1957**

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

In the Matter
of

POWER REACTOR DEVELOPMENT COMPANY.

Docket No. F-16.

ORDER EXTENDING TIME

At a session of the Atomic Energy Commission held in Washington, D. C., on the 31st day of July, 1957, Chairman Lewis Y. Strauss and Commissioners Willard F. Libby and Harold S. Vance present, it appeared that:

The provisional construction permit issued to Applicant dated August 4, 1956, was subject to the following condition:

"D. Unless, within twelve months from the date of this construction permit, PRDC submits sufficient information relating to its financial resources to enable the Commission to make a finding that the Company has adequate financial resources to meet the requirements of the law and the regulations, this permit shall expire; provided that the Commission may for good

cause shown extend the time for the submission of such data."

By order dated October 8, 1956, the Commission directed that a hearing be held on the application for construction permit upon certain issues, including the following:

"B. Whether, pursuant to Section 50.40(b) of the Commission's regulations, the applicant is financially qualified to engage in the proposed activities; and whether, pursuant to Section 50.60(c)(2), of the Commission's regulations, the applicant is financially qualified to receive an allocation of special nuclear material."

Extensive evidence relating to these issues of financial qualification has been introduced at the hearing in this proceeding. Much of that evidence has also been embodied in amendments to the License Application. Additional evidence

[6661]

relating to these issues may be introduced prior to the conclusion of the hearing. The Commission has not evaluated such evidence and does not contemplate doing so until after the record of the hearing is certified to it for its decision as provided in its Order of October 8, 1956.

The Applicant, by letter to the Director of Civilian Application, copies of which were sent to counsel for the remaining parties in this proceeding, has requested an extension of time specified in the aforesaid paragraph D for submission and evaluation of the requisite financial information until such time as the hearing now in progress

has been completed and the Commission has rendered its determination thereon.

Upon due consideration of the foregoing, and upon determination that good cause for such action has been shown;

It is Ordered That:

(1) Any evidence received at the hearing which is relevant to the issues of financial qualification shall be deemed information submitted in compliance with the requirement of the aforesaid paragraph D of the provisional construction permit.

(2) The time specified in the aforesaid paragraph D for submission and evaluation of any such information is extended until such time as the hearing required by the Commission's Order of October 8, 1956, is completed and the Commission has rendered its determination thereon.

UNITED STATES ATOMIC ENERGY
COMMISSION

By
Secretary

Dated: August 1, 1957

(SEAL)

[6873]

**Findings and Decision of Commission, December
10, 1958**

In addition to the facts found and conclusions of law reached in the course of the opinion, the Commission specifically finds and concludes:

1. Power Reactor Development Company (PRDC) is a duly organized non-profit corporation existing under the laws of the State of Michigan, and its operations will, if conducted according to the construction permit issued by this Commission dated August 4, 1956, be subject to the Atomic Energy Act of 1954, amendments thereto and the Rules and Regulations issued by this Commission.

2. PRDC has proposed the construction and, subject to later proceedings, the operation of utilization and production facilities as defined in Section 104 of the Atomic Energy Act and the Rules of this Commission, as a research and development facility consisting of a fast breeder nuclear reactor of 300,000 thermal kilowatts and 100,000 electric kilowatts capacity and having physical features described in the application and the ten amendments thereto which constitute a part of the files and record of the proceeding.

3. PRDC has been issued a construction permit on a provisional basis to construct a fast breeder reactor of the general type set forth in its application as amended prior to August 4, 1956. Developments in design resulting from improvements in technology require changes in and additions to some of the terms and conditions of the construction permit previously issued. These changes and additions are reflected in the amended construction permit attached hereto and made a part of our order.

[6874]

4. AEC interest in fast neutron systems goes back several years. Both AEC and the United Kingdom have operated a number of small uncooled critical assemblies and flexible critical experiments. AEC has operated two fast

reactors, "Clementine," a 25 thermal kilowatt plutonium-fueled reactor which operated from 1946-1952 and EBR-I, a 1400 thermal kilowatt (200 electrical kilowatt) uranium-fueled reactor which operated at the National Reactor Testing Station, Idaho, from August 1951-November 1955. The following fast reactors, in addition to Applicant's proposed reactor, are presently programmed:

a. EBR-I is being placed back into operation with two new cores, Mark III and Mark IV. The Commission takes official notice that EBR-I with the Mark III core became operational in November, 1957.

b. EBR-II, a 62,500 thermal kilowatt, (20,000 electrical kilowatt) uranium-fueled reactor, will be constructed at the National Reactor Testing Station in Idaho. The Commission takes official notice that funds for construction of EBR-II have been authorized and that construction of EBR-II is currently scheduled to be completed in December, 1959.

c. A uranium-fueled reactor with a rated capacity of 60,000 thermal kilowatts is presently under construction at Dounreay, Scotland, by the United Kingdom and is scheduled for completion in December of 1958.

[6875]

5. Technology regarding fast breeder nuclear reactors is a rapidly advancing art and utilization and production facilities that will permit the most complete use of fuel for atomic energy offer a substantial advancement in this field. The research and development project proposed by PRIC reflects the largest plant in the United States to date which would utilize energy produced by the fast breeder process.

Information is increasing as experiments and corroborative data are supplied regarding the safety in operation of such a plant. Several experiments with existing or proposed fast breeder reactor plants will provide information helpful in the consideration of the operation of the PRDC plant. There is no inherent hazard or danger to the health and safety of the public in the construction or operation of fast breeder reactors.

6. The EBR-II and PRDC reactors are similar in neutron spectrum and flux, power density, fuel element design and coolant operating conditions, but differ in a number of design aspects. Both are based on EBR-I. EBR-II has a more advanced design, and is intended as a flexible experimental facility.

7. The Dounreay and PRDC reactors operate in the same neutron spectrum and have many common characteristics, but also have many differences in detail.

8. Neither EBR-I, EBR-II, nor Dounreay can be considered a direct prototype of the PRDC reactor.

[6876]

9. There is considerable experience in the use of sodium and related materials as coolants, including investigations of sodium technology at Commission laboratories since 1945; operation of EBR-I, the submarine intermediate reactor, and the sodium reactor experiment at Santa Susana, California; and performance tests on mock-ups of the EBR-II sodium system. In general, these sodium systems have operated successfully and have demonstrated the ability to

achieve satisfactory purity of sodium and to avoid significant corrosion.

10. Construction of the proposed PRDC reactor on the proposed time schedule represents a greater and more rapid extension of reactor technology beyond demonstrated practice than construction of the other civilian power reactors presently being completed in populated places.

11. The proposed experiments with the EBR-I Mark III core are intended to determine definitively whether bowing is the cause of the positive temperature coefficient observed in EBR-I. If properly carried out, they are expected definitively to establish the correctness or incorrectness of the bowing hypothesis.

12. It is highly probable that bowing can be prevented by proper mechanical design. Applicant has proposed three means of preventing inward bowing of the PRDC core.

13. There is still considerable doubt about the cause of the resonance instabilities observed in EBR-I. They may be attributable to the use of series rather than parallel flow of the coolant through the core and

[6877]

blanket, and the experiments with the Mark III core are designed to test this hypothesis. The PRDC design proposes parallel flow.

14. Apart from certain problems of prompt acting positive temperature coefficients and resonance effects, the answers to which are not yet completely known, fast reactors are generally considered to be as easy to control as thermal

reactors. Indeed, it is possible to operate a fast reactor with a relatively small amount of excess reactivity available, thereby ensuring that an accidental sudden withdrawal of all controls will not result in a dangerous nuclear runaway. PRDC proposes, at least during the early years of operation, to adhere to such a limitation of excess reactivity.

15. Although many questions remain to be answered regarding the problem of meltdown and disassembly or reassembly of the core or a substantial portion thereof, the existence of these problems does not negate the likelihood that they will be answered in due course and in time for the answers to precede any decision of the Commission with regard to an operating license for the proposed PRDC reactor; likewise, design modifications may be available as a means of avoiding these problems.

16. In view of the relative lack of operating experience with fast power reactors, additional satisfactory operating experience with such reactors prior to the commencement of operation of Applicant's proposed reactor will be highly desirable. Present schedules indicate that considerable operating experience with EBR-I and Dounreay, and possibly some with EBR-II, will have been obtained prior to the start of PRDC test operations.

[6878]

17. It is possible that there may be presently unknown effects in large fast reactor systems. A prototype of the proposed reactor at a remote location has been urged as affording greater assurance against the possibility of such

unknown effects than does the presently planned experimental and theoretical programs. The Commission finds that the necessity, however, for constructing such a prototype has not been shown. If the program of meltdown investigation should prove inconclusive, it will be necessary to reconsider the question of need for a prototype.

18. Based on the foregoing findings, the Commission further finds—

a. that it has not yet been positively established that a fast breeder reactor of the general type and power level proposed by Applicant can be *operated* without a credible possibility of releasing significant quantities of fission products to the environment;

b. that there is reasonable assurance that theoretical and experimental investigations which have been undertaken, together with operating experience on one or more of the EBR-I, EBR-II and Dounreay reactors, will establish definitively, prior to the scheduled completion date of the PRDC reactor, whether or not the reactor proposed by Applicant can be so operated;

c. that it is probable that evidence will establish that the reactor proposed by Applicant can be so operated.

[6879]

19. The proposed site is located on the shore of Lake Erie about thirty miles from Detroit, Michigan, twenty-five miles from Toledo, Ohio, seven and one-half miles from Monroe, Michigan, and ten miles from the Canadian border. The site is bordered on one side by water and provides an exclusion area on the land side with a minimum radius of

2900 feet. The population distribution for given distances from the site is as follows:

<i>Miles</i>	<i>Population</i>
1	175
2	600
5	1,800
10	31,300
20	187,100
30	2,001,700

During the summer months the population within five miles would be increased due to vacating transients and to the fact that beaches two to five miles southwest of the site may be crowded with thousands of people.

20. The site is satisfactory from structural and underground water flow standpoints. The meteorology of the site is complex, but no reason is known for it to be disqualifying. Studies of the meteorology, lake currents, air diffusion, flooding and other problems will be completed before the question of a license to operate is before the Commission. Design modifications required by the results of those studies can be considered at that time.

[6880]

21. A definitive evaluation of the suitability of the proposed site cannot be made at the present time. In view of the population density around the site, its suitability for the proposed reactor depends upon the inherent safety of the reactor and a demonstration that no credible accident can release significant quantities of fission products into the atmosphere. If the foregoing are established, and there is

reasonable assurance that they can be, it is probable that the site will prove suitable for the proposed reactor.

22. The Commission finds reasonable assurance in the record that a utilization facility of the general type proposed in the PRDC application and amendments thereto can be constructed and will be able to be operated at the location proposed without undue risk to the health and safety of the public.

23. Applicant's current estimate for the cost of construction, preconstruction research and development, and administrative expenses during construction and test operation is \$44,020,000. It has assets, consisting of firm commitments for contributions from members and an executed bank loan agreement, totalling \$49,448,000 and thus exceeding its estimated costs by \$5,428,000. The member companies of PRDC should provide additional funds, if necessary, to take care of adverse contingencies. Applicant's utility members have combined equity assets of \$2 billion.

[6881]

24. There is a reasonable possibility of a cost over-run on construction and research and development, and increases have already occurred on specific items. The record, however, does not demonstrate that such an over-run will exceed Applicant's available assets by any amount and especially by an amount large enough to disprove PRDC's financial qualification.

25. Provision is made in Applicant's cost estimates for payment of Commission charges for use and burn-up of

source and depleted material. The amount of possible Commission charge for loss of depleted and special nuclear material has not been identified and will depend on determination of the magnitude and consequences of the maximum credible accident. Applicant believes that in any accident a substantial part of the material would be reclaimable and that its exposure to a charge for loss is on the order of \$1 million. It expects to cover its potential liability for loss by either insurance, application of its unencumbered assets, or a guarantee from its sponsors. The Commission finds that Applicant has shown a reasonable probability of being able to pay Commission charges for loss of special nuclear material through 1963.

26. The fast breeder reactor is one of the promising types for the development of electric power on a commercially feasible basis. Demonstration of the economic practicability of breeding would increase by many times the available reserves of nuclear fuel by facilitating the conversion into plutonium and use as fuel the uranium-238 isotope which comprises 99.3% of the natural uranium.

[6882]

27. By proceeding with construction and further research and development simultaneously, rather than awaiting complete research and development results Applicant will save several years in the time required to place in operation its demonstration power reactor.

28. The proposed reactor will be a utilization facility within the meaning of 10 CFR 50.2(b) and will be involved in the conduct of research and development activities lead-

ing to the demonstration of the practical value of such facilities for industrial and commercial purposes.

29. Applicant and the organizations with which it is associated by contract are technically qualified to design and construct the reactor described in the Application.

30. Data presently available indicate that a reactor of the general type described in the Application can be so designed that no credible accident in the course of its operation is likely to result in the release of significant quantities of fission products into the atmosphere; this conclusion has not been demonstrated sufficiently at this time to justify issuance of an operating license.

31. Theoretical and experimental programs are underway that should establish the conclusion stated in paragraph 30 sufficiently to justify the issuance of an operating license; the record shows a definite preponderance of expert opinion to this effect, and the results of these programs should be available prior to the time it is necessary for the Commission to rule on the operating aspect of license application.

[6883]

32. The proposed site is generally suitable for a reactor of the type and size described in the Application, if the reactor is otherwise shown to be capable of operation without undue hazard, including demonstrations of stability and adequate containment. Adequate investigations are under way to establish the characteristics of the chosen site, including all relevant aspects, and the record shows

that to this point the site is satisfactory from the standpoint of protection of the public from undue hazard.

33. There is reasonable assurance that technical information omitted from the Application and required to complete the Application will be supplied prior to the time when it is necessary for the Commission to rule on the license application itself.

34. The Applicant is financially qualified to engage in the construction and operation of the reactor described in the Application and to receive the allocation of special nuclear material therefor.

35. The issuance of a construction permit to the Applicant will not be inimical to the common defense and security or to the health and safety of the public.

36. Procedure for continuing review of the PRDC project must be established, as hereinafter ordered, so as to require both PRDC and the separated staff of the AEC, and to permit the Interveners in this proceeding, to submit to all participants in the proceeding, as well as file with the Secretary of the Commission, where they will be publicly

[6884]

available, data coming to the attention of any one of them pertinent to safety in construction, design and operating characteristics of fast breeder nuclear reactors similar or identical to the PRDC project, thus to enable the Commission to consider such data and to provide for a further hearing in this instant matter, if deemed advisable prior to the final license proceeding. It is not anticipated that a

hearing would be advisable or necessary upon the filing of each portion of data, but when any single filing itself or the accumulation of data filed warrants, the Commission intends on either its own motion or the motion of one of the participants to set a hearing to provide for further review of safety considerations.

37. Proceedings for a license to *operate* the proposed PRDC plant shall be held at a time later to be determined, after the completion of construction. In that proceeding the safety considerations of the PRDC project will be in issue, and we shall again consider whether the PRDC plant can be operated with reasonable assurance for the protection of the health and safety of the public. Commissioners Vance and Floberg join in this opinion. Commissioner Graham concurs as shown by his accompanying separate opinion. Commissioner Libby was absent from the oral argument because of illness and took no part in the consideration or decision in this case. Chairman McCone's term as a Commissioner commenced after the date of oral argument, and he took no part in the consideration or decision in this case.

HAROLD S. VANCE

Commissioner

JOHN F. FLOBERG

Commissioner

[6885]

Graham, Commissioner (concurring): My analysis of the case leads me to concur on grounds stated below without the extensive comment and broad treatment set forth in the majority opinion. The findings of fact in the main body of that opinion seem quite sufficient to me to dispose of the case.

The issues originally set forth by the Commission in the October 8, 1956, notice of hearing, order and memorandum directing that a hearing be held before Mr. Jay A. Kyle, Examiner, are quoted in full in the body of the opinion. I need not restate them here.

With regard to Issue A, Part 1, I believe that the record contains sufficient evidence, for the present purposes, to provide reasonable assurance that a facility of the general type proposed can be constructed and operated at this proposed location without undue risk to the health and safety of the public. It is not necessary for the Commission now to require absolute assurance. That issue will be finally decided later. With regard to Issue A, Part 2, there is also reasonable assurance, if the applicant complies with the interim order, that adequate technical information will be supplied and the application completed before the Commission determines whether a license should issue.

Issues B, C, and D of the original order are disposed of by the main body of the opinion of my colleagues and by what follows herein.

The record indicates that none of the questions relating to reactor safety, the feasibility of the reactor design, and the adequacy of the financing can be absolutely and finally answered at this time. Consequently an interim order is being entered which in essence specifically reserves

[6886]

to the Commission its responsibility to rule upon such questions at any time prior to the consideration of an ap-

application for an operating license. The interim order requires periodic reports from PRDC and APDA to be filed with the Secretary of the Commission. These are to be served on the Interveners and also are to be made available to other interested persons. Such reports are designed to bring up to date the data relating to the scientific and technical investigations as well as to reveal current financial status of the project.

The interim order permits the continuance of construction of this project, subject to faithful performance of the conditions required with respect to reporting. Continuance of this construction permit is not to convey to the applicant that it has gained any assurance of favorable action if, and when, an application is made for a permit to operate the reactor facility.

JOHN S. GRAHAM

Commissioner

[6887]

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

In the Matter
of
POWER REACTOR DEVELOPMENT COMPANY.

Docket No. F-16

ORDER

On the basis of the Opinion and Initial Decision adopted this day in the above entitled cause, the Commission hereby orders that:

A. The construction permit heretofore issued to Power Reactor Development Company on August 4, 1956, is hereby affirmed and continued in effect with such modifications and additions as are shown in the permit hereto attached and made a part of this order.

B. The amendments filed by PRDC after the issuance of the provisional construction permit on August 4, 1956, are added to and incorporated in the record.

C. Procedure is hereby established for continuing review of the safety characteristics of the PRDC fast breeder nuclear reactor plant. PRDC and the separated staff of this Commission are directed, and

6888

any intervener herein is permitted, to serve upon all participants herein and to file with the Secretary of this Commission, who will make them publicly available to anyone concerned, data pertinent to the safety in construction, design and operating characteristics of fast breeder nuclear reactors similar or identical to the PRDC project so as to permit

[6888].

review by the Commission, which may set down for hearing, when deemed advisable, the further consideration of such data.

D. The application by PRDC for exemptions from any of the Regulations of this Commission is denied.

WOODFORD B. McCOOL
Secretary

Dated: December 10, 1958

SEAL

[6889]

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

In the Matter
of
POWER REACTOR DEVELOPMENT COMPANY.

Docket No. E-16

CONSTRUCTION PERMIT AS AMENDED

The Construction Permit heretofore issued in this proceeding is amended to read as follows:

Pursuant to the Atomic Energy Act of 1954, as amended, and Title 10, CFR Chapter 1, Part 50, "Licensing of Production and Utilization Facilities", the Commission hereby issues a provisional construction permit to Power Reactor Development Company, a Michigan corporation, (hereinafter "PRDC") to construct the facility described herein as a utilization facility in accordance with the application and amendments thereto filed in this docket. This permit shall be deemed to contain and be subject to the conditions specified in Sections 50.54 and 50.55 of said regulations; is subject to all applicable provisions of the Atomic Energy Act of 1954, as amended, and rules, regulations and orders of the Atomic Energy Commission now or hereafter in effect; and is subject to any additional conditions specified or incorporated below:

A. The earliest date for completion of the facility is December 15, 1959. The latest date for completion of the facility is December 15, 1960. The term "completion date" as used herein means the date on which the construction of the reactor is completed except for the introduction of the fuel material.

[6890]

B. The site proposed for the facility is the location known as Lagoon Beach, Monroe County, Michigan, described in the application.

C. The general type of facility authorized for construction is an enriched uranium fueled, sodium cooled fast neutron breeder reactor designed to produce approximately 100,000 kilowatts of electrical energy, with associated structures, as described in the application, and the amendments filed thereto.

D. The applicant may proceed to design and construct the proposed facility without further authorization in accordance with the application and the amendments thereto filed in this proceeding and heretofore made a part of the record herein. This permit, however, does not constitute final approval of any technical specification of the facility. Before a license is issued to operate the facility, the Commission must finally approve all technical specifications. If the applicant desires any final approval of any particular specification prior to the issuance of a license to operate, it may request that the Commission grant specific approval of any specification by appropriate amendment to this permit.

E. Within three (3) months from the date of this amended permit and at three-month intervals thereafter, or less if in its judgment significant changes or developments have occurred, Applicant shall submit, under oath or affirmation, reports showing—

1. The status of technical investigations being conducted by or for PRDC on the following subjects, and any results obtained therefrom:

[6891]

a. stability of fast reactors, including autocatalytic and resonance effects;

b. revised temperature and power coefficients of the proposed PRDC reactor;

c. validity of oscillator technique to determine either of the foregoing;

d. possibility and consequences of meltdown of a core of a fast reactor;

e. adequacy of containment proposed for PRDC reactor, including missile effects;

f. meteorology, hydrology, lake current and flooding studies, and other significant environmental information concerning the proposed site;

g. analysis of maximum credible accident.

2. Decisions made by Applicant as to any design changes referred to in the written testimony in this proceeding, and any other design changes of the facility significantly affecting public safety;

3. Status of construction of the project, scheduled dates of design freezes on major components, and any changes in scheduled completion date.

F. Within six months from the date of this permit and at six-month intervals thereafter, Applicant shall submit reports, under oath or affirmation, showing financial statements of PRDC and APDA, current cost

[6892]

estimates for construction and research and development in connection with the project, and a current statement of source and allocation of case during a ten-year operating period.

This permit is provisional to the extent that a license authorizing operation of the facility will not be issued by the Commission unless PRDC has submitted to the Commission (by proposed amendment to the application) the complete, final Hazards Summary Report (portions of which may be submitted and evaluated from time to time) and the Commission has found that the final design provides reasonable assurance that the health and safety of the public will not be endangered by operation of the facility in accordance with the specific procedures.

It is further provisional to the extent that the Commission reserves jurisdiction, at any time prior to issuance of an operating license, upon notice to the parties herein, to reopen this proceeding for the purpose of receiving additional evidence, and to make such determinations and take such action with respect to the continuance, vacation, or modification of this permit as the entire record warrants.

Upon completion (as defined in Paragraph A above) of the construction of the facility in accordance with the terms

and conditions of this permit, as amended, upon the filing of any additional information needed to bring the original application up to date, upon filing of proof of financial protection and execution of an indemnity agreement as required by Section 170 of the Act and 10 C. F. R. Part 140, upon a finding that the facility authorized has been constructed in conformity with the application as amended and in conformity with the provisions of the Act and the rules

[6893]

and regulations of the Commission, and upon a further finding, after conclusion of additional proceedings, if they be necessary or appropriate, of reasonable assurance of safety of operation, the Commission will consider the issuance of a license to PRDC pursuant to Section 104(b) of the Act, which license will, if issued, expire August 4, 1981.

Pursuant to Section 50.50 of the regulations in Title 10, Chapter 1, C. F. R., Part 50, the Commission has allocated to PRDC for use in connection with the reactor, 3,117.35 kilograms of uranium-235 contained in uranium at the isotopic ratios specified in PRDC's application for the license. Estimated schedules of special nuclear material transfers to PRDC and returns to the Commission are contained in Appendix "A" which is attached hereto. Shipments by the Commission to PRDC in accordance with column 2 of Appendix "A" will be conditioned upon PRDC's return to the Commission of material substantially in accordance with column 3 of Appendix "A".

[6894]

APPENDIX "A"

TO

POWER REACTOR DEVELOPMENT COMPANY

CONSTRUCTION PERMIT

Estimated Schedule of Transfers of Special Nuclear Material from the Commission to PRDC and to the Commission from PRDC:

(1) Date of Transfer (Calendar Year)	(2) Transfers from AEC to PRDC Kgs. U-235	Returns by PRDC to AEC Kilograms U-235		Net Yearly Distribution Kgs. U-235	Cumulative Distribution Kgs. U-235
		Recoverable Scrap	Spent Fuel		
1958	673.19	134.57	—	538.62	538.62
1959	—	—	—	—	—
1960	436.43	87.21	—	349.22	887.84
1961	969.03	193.64	572.29	203.10	1,090.94
1962	887.65	177.39	795.45	(85.19)	1,005.75
1963	1,346.30	269.06	765.88	311.36	1,317.11
1964	1,409.59	221.75	915.95	(28.11)	1,289.00
1965	1,050.41	209.93	758.61	81.87	1,370.87
1966	1,257.53	251.32	780.88	225.33	1,596.20
1967	909.85	181.82	735.77	(7.74)	1,588.46
1968	1,109.59	221.75	778.03	109.81	1,698.27
1969	1,331.48	266.09	839.00	226.39	1,924.66
1970	1,139.18	227.66	838.43	73.09	1,997.75
1971	1,109.59	221.75	776.47	111.37	2,109.12
1972	1,272.32	254.26	776.90	241.16	2,350.28
1973	1,198.34	239.49	890.32	68.53	2,418.81
1974	1,257.53	251.32	781.39	224.82	2,643.63
1975	1,124.36	224.69	735.45	164.22	2,807.85
1976	1,498.34	239.49	839.01	119.84	2,927.69
1977	1,168.78	233.58	776.55	158.65	3,086.34
1978	1,139.18	227.66	955.33	(43.81)	3,042.53
1979	1,257.53	251.32	931.39	74.82	3,117.35
1980	909.85	181.82	735.64	(7.61)	3,109.74
1981	—	—	471.09	(471.09)	2,638.65
	23,856.05	4,767.57	16,449.83	2,638.65	

[6933]

**Commission's Opinion, Final Decision and Order,
May 26, 1959.**

**UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION**

**In the Matter
of
POWER REACTOR DEVELOPMENT COMPANY.**

Docket No. F-16.

OPINION AND FINAL DECISION.

This matter comes before the Commission for final decision pursuant to the Atomic Energy Act of 1954,¹ as amended, the Administrative Procedure Act of 1946,² and the Commission's Rules of Practice.³ Exceptions to our Opinion and Initial Decision dated December 10, 1958, were filed by three unions (herein called Intervenors), and these Intervenors and the other parties to the proceeding have filed extensive briefs with the Commission.

¹ 42 U. S. C. § 2011 *et seq.*

² Section 8, 5 U. S. C. § 1007. Section 181 of the Atomic Energy Act, 42 U. S. C. § 2231, makes the provisions of the Administrative Procedure Act applicable to "all agency action" taken under the Atomic Energy Act of 1954.

³ 10 C. F. R. § 2.754, implementing Section 8(b) of the Administrative Procedure Act, provides in relevant part:

"(a) Upon submission of a case to the Commission for final decision, the Commission will normally consider the whole record. * * *

"(b) The final decision shall be in writing and shall contain:

(1) A statement of findings and conclusions, with the reasons or basis therefor, upon all the material issues of fact, law, or discretion presented;

[6934]

As in the case of our initial decision, the precise question now before the Commission is whether a provisional construction permit issued to Power Reactor Development Company (PRDC) on August 4, 1956, should be continued, modified, suspended, rejected or otherwise disposed of. The principal arguments made by the Intervenor are that the Commission illegally issued the conditional construction permit and that the alleged illegal issuance of the construction permit, and our refusal to suspend it, so vitiated the entire course of the proceeding as to deny them due process and a fair hearing.

In their exceptions and supporting brief the Intervenor have requested the Commission to reexamine all of the prior briefs and arguments in the proceeding, and for this reason we have felt obliged to broaden the scope of review in our consideration of a final decision. Because of this fact and because of the importance of this case as the initial construction permit proceeding before the Commission, our Opinion and Final Decision deal in detail with all such issues, and we amplify and affirm our Opinion and Initial Decision dated December 10, 1958.

As we set forth in detail in our Opinion and Initial Decision, the Intervenor, as well as all other parties, have been accorded every procedural safeguard consistent with the

³ (Cont'd) (2) All facts officially noticed * * *, relied upon in this decision;
 (3) The ruling on each relevant and material exception filed;
 (4) The appropriate rule, order, sanction, relief, or denial thereof, with the effective date."

[6935]

prompt and expeditious disposition of an adjudicatory proceeding. On four separate occasions we have issued orders and memoranda with respect to the conduct of the proceeding,⁴ and numerous pleadings and motions have been filed by the Intervenor^s and other parties herein to which we have given careful consideration.

The original conditional construction permit was issued by the Commission on August 4, 1956, and the Intervenor^s intervened in this proceeding on August 31, 1956. The hearing did not commence until January 8, 1957, and then only after informal and formal prehearing conferences. The hearing lasted with intermittent recesses until August 7, 1957. In accordance with our original order for hearing, the Hearing Examiner certified the record to us for initial decision, and the case was argued orally before the Commission on May 29, 1958.

⁴ Order and Memorandum October 8, 1956, 6 Ad. L. 2d 549, dealing with conduct of hearing and issues therein; Order and Memorandum December 21, 1956, dealing with request for reconsideration of October 8, 1956, order and other matters; Order and Memorandum February 28, 1957, denying interlocutory appeal from order and ruling of Hearing Examiner on permissive use of narrative testimony; and Order March 5, 1957, 6 Ad. L. 2d 891, denying motion for access to Restricted Data without security clearance. Subsequent to our Opinion and Initial Decision, on February 3, 1959, we refused to accept for filing certain "Exceptions" dated December 19th and 22, 1958, and tendered by Elliot Earl, of Manchester, Conn., who had been permitted to participate in the proceeding on a limited basis pursuant to 10 C. F. R. § 2.731. The "Exceptions" were accepted for filing as a supplement to the "Statement of Position" filed by Mr. Earl. Statements of position requesting that the provisional construction permit be suspended were received from the AFL-CIO and Cooperative League of America, which also made limited appearances. The State of Michigan, which had been permitted to intervene in the proceeding, filed a statement taking no firm position with respect to the merits of the proceeding but emphasizing its responsibility for the health, safety, and welfare of its citizens.

[6936]

Aside from the Application and its exhibits aggregating about 1200 pages, the record of hearing comprises ap-

proximately 5100 pages of other exhibits, narrative testimony, and transcript. AEC went to extraordinary lengths to make both its officers and its consultants available as witnesses at the hearing. Of the 17 witnesses who testified, 12 were connected with the Commission in either an official or consulting capacity, and all of the Intervenor's four witnesses were connected with the AEC. No resistance was interposed to subpoenas issued to any of these witnesses.

Significantly, Intervenor's failed to except to our finding and provision for procedure for continuing review of the PRDC project, although they did claim that our order was "erroneous" without any explanation of the grounds therefor. Effective upon issuance of the initial decision, this procedure was established in the public interest and that of the Intervenor's. It requires both PRDC and the separated staff of AEC, and permits the Intervenor's to submit to all participants in the proceeding data coming to the attention of any one of them pertinent to safety in construction, design, and operating characteristics of fast breeder reactors similar or identical to the PRDC project. Under this procedure we are enabled, on the record, to consider new information material to the project and to provide for a further hearing in the matter, if deemed desirable prior to the final operating license proceeding.

[6937]

Pursuant to this procedure, on March 9, 1959, PRDC filed with the Commission its "First Quarterly Technical Report" dated March 6, 1959, together with 13 exhibits. On the same date the separated AEC staff filed with the

Commission its first "Report by AEC staff on Fast Breeder Reactor Safety Data," together with 36 reports and documents. On April 2, 1959, PRDC filed with the Commission its "First Semiamual Report of Power Reactor Development Company as of December 31, 1958", dated March 27, 1959. Copies of all the above reports and documents have been filed with the parties in the proceeding and are available to the public in the Commission's Public Document Room. Since the above reports and documents have not been formally presented on the record by any party, subject to cross examination, we have taken no notice of the matter contained therein in this Opinion and Final Decision.

As more particularly hereinafter set forth, we find that none of the exceptions taken by the Intervenors are supported in the whole record or in law. Further, we find that none of the procedural errors alleged by the Intervenors have in fact denied the Intervenors a fair hearing, and there has been no substantial prejudice to the Intervenors or any injury to the public interest as a result of these proceedings. As we made clear in our initial decision, the prime concern of the Commission is that the proposed reactor be constructed and operated without undue hazard to the public health and safety. As Intervenors concede, no hazard

[6938]

whatsoever is involved in the construction of the project. Before we authorize the issuance of an operating license to PRDC at a further reopening of this proceeding, we will require that all safety questions be answered to our

complete satisfaction, as required by the statute and our regulations. Under such circumstances, the public interest and that of the Intervenor have been protected.

[6939]

I. STATUTES AND REGULATIONS

This proceeding requires us, for the first time in an adjudication, to construe and apply several provisions of the Atomic Energy Act of 1954 and our own regulations which relate to the issuance of construction permits and licenses for power reactors. Intervenor attack our construction of the relevant statutory and rule provisions, as set forth in our initial decision, principally on the grounds that (1) "[i]t appears to be the view of the Commission that there are no established standards governing the issuance of construction permits and . . . the Commission has, in effect, uncontrolled discretion in the granting of such permits", and (2) our decision "simply sweeps aside any limitations imposed by" the statute and our regulations.⁵ Closely allied with these contentions is the position of Intervenor that the same findings, with respect to safety and financial qualification, for issuance of an operating license are necessary for issuance of a provisional construction permit. For the reasons hereafter set forth, we must reject these arguments.

⁵ Intervenor's Exceptions to Opinion and Initial Decision, with Supporting Brief, pp. 9-11.

[6940]

1. Statute

Congress, in the Atomic Energy Act of 1954, provided for two types of licenses with respect to the development

and production of electric power. The Section 103⁶ class of license for

*42 U. S. C. § 2133, "Commercial Licenses", which provides, in pertinent part:

"a. Subsequent to a finding by the Commission as required in section 102, the Commission may issue licenses to transfer or receive in interstate commerce, manufacture, produce, transfer, acquire, possess, [or] use, . . . such type of utilization or production⁷ facility. Such licenses shall be issued in accordance with the provisions of chapter 16 and subject to such conditions as the Commission may by rule or regulation establish to effectuate the purposes and provisions of this Act.

"b. The Commission shall issue such licenses on a non-exclusive basis to persons applying therefor (1) whose proposed activities will serve a useful purpose proportionate to the quantities of special nuclear material or source material to be utilized; (2) who are equipped to observe and who agree to observe such safety standards to protect health and to minimize danger to life or property as the Commission may by rule establish; and (3) who agree to make available to the Commission such technical information and data concerning activities under such licenses as the Commission may determine necessary to promote the common defense and security and to protect the health and safety of the public. All such information may be used by the Commission only for the purposes of the common defense and security and to protect the health and safety of the public.

"c. Each such license shall be issued for a specified period as determined by the Commission, depending on the type of activity to be licensed, but not exceeding forty years, and may be renewed upon the expiration of such period.

"d. No license under this section may be given to any person for activities which are not under or within the jurisdiction of the United States. . . . No license may be issued to an alien or any corporation or other entity if the Commission knows or has reason to believe it is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. In any event, no license may be issued to any person within the United States if, in the opinion of the Commission, the issuance of a license to such person would be inimical to the common defense and security or to the health and safety of the public."

[6941]

operation of a power plant requires a finding that the proposed utilization⁷ or production facility⁸ has been sufficiently developed to be of practical value for industrial or commercial purposes. In addition to the medical therapy provisions thereof⁹ not pertinent to this proceeding, Section 104 of the statute provides for a reactor of a research and developmental character and envisions progress towards practical applications, as follows:

Defined in Section 11a(1) of the statute, 42 U. S. C. § 2014(aa)(1), to include, "any equipment or device, except an atomic weapon, determined by rule of the Commission to be capable of making use of special nuclear material in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public, or peculiarly adapted for making use of atomic energy in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public". 10 C. F. R. § 50.2(b) further defines a utilization facility as meaning "any nuclear reactor other than one designed or used primarily for the formation of plutonium or U-233".

Defined in Section 11t(1), 42 U. S. C. § 2014(t)(1), as meaning "any equipment or device determined by rule of the Commission to be capable of the production of special nuclear material in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public". 10 C. F. R. § 50.2(a)(1) further defines a production facility as, among other things, "any nuclear reactor designed or used primarily for the formation of plutonium or uranium 233".

42 U. S. C. § 2134, "Medical Therapy and Research and Development".

[6942]

"b. The Commission is authorized to issue licenses to persons applying therefor for utilization and production facilities involved in the conduct of research and development activities leading to the demonstration of the practical value of such facilities for industrial or commercial purposes. In issuing licenses under this subsection, the Commission shall impose the minimum amount of such regulations and terms of license as will permit the Commission to fulfill its obligations under this Act to promote the common defense and security and to protect the health and safety of the public and will be compatible with the regulations and terms of license which would apply in the event that a commercial license were later to be issued pursuant to section 103 for that type of facility. In issuing such licenses, priority shall be given to those activities which will, in the opinion of the Commission, lead to major advances in the application

of atomic energy for industrial or commercial purposes.

* * * *

"d. No license under this section may be given to any person for activities which are not under or within the jurisdiction of the United States, . . . * * *

In any event, no license may be issued to any person within the United States if, in the opinion of the Commission, the issuance of a license to such person would be inimical to the common defense and security or to the health and safety of the public."

Once a finding of practical value can be made under Section 102¹⁰ of the statute with respect to a reactor type licensed under

¹⁰ 42 U. S. C. § 2132, "Finding of Practical Value," which provides: "Whenever the Commission has made a finding in writing that any type of utilization or production facility has been sufficiently developed to be of practical value for industrial or commercial purposes, the Commission may thereafter issue licenses for such type of facility pursuant to section 103." According to the Joint Committee on Atomic Energy, "[t]his finding [under Section 102] separates the issuance of research and development licenses for any facility under section 104b., and the issuance of commercial licenses under section 103." S. Rep. No. 1699, 83d Cong., 2d Sess. 19 (1954), 1. Legislative History of the Atomic Energy Act of 1954 767 (1955) (hereafter Leg. Hist.).

• [6943]

Section 104, then the utilization facility involved would normally be licensed as a Section 103 commercial reactor.¹¹

Section 182 of the statute¹² provides, among other things, for the submission of applications for licenses setting forth "such information as the Commission, by rule or regulation, may

¹¹ This scheme of licensing implements the purposes of the statute for "a program of conducting, assisting, and fostering research and development in order to encourage maxim scientific and industrial progress" and "a program to encourage widespread participation in the development and utilization of

atomic energy for peaceful purposes to the maximum extent consistent with the common defense and security and with the health and safety of the public", Sections 3a. and d., 42 U. S. C. §§ 2013(a) and (d). In line with these basic objectives, Sections 31-33 of the 1954 Act authorize and direct the Commission to conduct research and development and to foster and encourage the conduct of research and development by others, in fields related to the civilian uses of atomic energy, including "the demonstration of the practical value of utilization or production facilities for industrial or commercial purposes," 42 U. S. C. §§ 2051-2053.

"42 U. S. C. § 2232, "License Applications," which reads, in pertinent part:

"a. Each application for a license hereunder shall be in writing and shall specifically state such information as the Commission, by rule or regulation, may determine to be necessary to decide such of the technical and financial qualifications of the applicant, the character of the applicant, the citizenship of the applicant, or any other qualifications of the applicant as the Commission may deem appropriate for the license. In connection with applications for licenses to operate production or utilization facilities, the applicant shall state such technical specifications, including information of the amount, kind, and source of special nuclear material required, the place of the use, the specific characteristics of the facility, and such other information as the Commission may, by rule or regulation, deem necessary in order to enable it to find that the utilization or production of special nuclear material will be in accord with the common defense and security and will provide adequate protection to the health and safety of the public. Such technical specifications shall be a part of any license issued. The Commission may at any time after the filing of the original application, and before the expiration of the license, require further written statements in order to

[6944]

determine to be necessary to decide such of the technical and financial qualifications of the applicant, . . . or any other qualifications of the applicant as the Commission may deem

¹² (cont'd) enable the Commission to determine whether the application should be granted or denied or whether a license should be modified or revoked. All applications and statements shall be signed by the applicant or licensee. Applications for, and statements made in connection with, licenses under sections 103 and 104 shall be made under oath or affirmation. The Commission may require any other applications or statements to be made under oath or affirmation.

"b. The Advisory Committee on Reactor Safeguards shall review each application under section 103 or 104 b. for a license for a facility, any application under section 104 c. for a testing facility, and any application under section 104 a. or c. specifically referred to it by the Commission, and shall submit a report thereon, which shall be made part of the record of the application and available to the public, except to the extent that security classification prevents disclosure.

"c. The Commission shall not issue any license for a utilization or production facility for the generation of commercial power under section

103, until it has given notice in writing to such regulatory agency as may have jurisdiction over the rates and services of the proposed activity, to municipalities, private utilities, public bodies, and cooperatives within transmission distance authorized to engage in the distribution of electric energy and until it has published notice of such application once each week for four consecutive weeks in the Federal Register, and until four weeks after the last notice."

[6945]

appropriate for the license." Under Section 183,¹³ each license "shall be in such form and contain such terms and conditions as the Commission may, by rule or regulation, prescribe to effectuate the provisions of this Act." Sections 161b. and i.¹⁴ generally authorize the Commission to promulgate rules in the performance of its functions.

The rules and regulations of the Commission with respect to the procedure for the granting, revocation, and suspension of licenses do not make a distinction between Section 103 and

¹³ 42 U. S. C. § 2233, "Terms of Licenses," which provides:

"Each license shall be in such form and contain such terms and conditions as the Commission may, by rule or regulation, prescribe to effectuate the provisions of this Act, including the following provisions:

"a. Title to all special nuclear material utilized or produced by facilities pursuant to the license, shall at all times be in the United States.

"b. No right to the special nuclear material shall be conferred by the license except as defined by the license.

"c. Neither the license nor any right under the license shall be assigned or otherwise transferred in violation of the provisions of this Act.

"d. Every license issued under this Act shall be subject to the right of recapture or control reserved by section 108, and to all of the other provisions of this Act, now or hereafter in effect and to all valid rules and regulations of the Commission."

¹⁴ 42 U. S. C. §§ 2201 (b) and (i).

[6946]

Section 104 licenses. The substantive standards for the issuance of each such license type differ to some extent, because of the distinction which Congress has made between

the purposes of commercial and developmental licenses.¹⁵ Under Section 185 of the Act,¹⁶ ordinarily a construction permit must be issued prior to licensing under either Section 103 or Section 104. This section provides:

"All applicants for licenses to construct or modify production or utilization facilities shall, if the application is otherwise acceptable to the Commission, be initially granted a construction permit. The construction permit shall state the earliest and latest date for the completion of the construction or modification. Unless the construction or modification of the facility is completed by the completion date, the construction permit shall expire, and all rights thereunder be forfeited, unless upon good cause shown, the Commission extends the completion date. Upon the completion of the construction or modification of the facility, upon the filing of any additional information needed to bring the original application up to date, and upon finding that the facility authorized has been constructed and will operate in conformity with the application as amended and in conformity with the provisions of this Act and of the rules and regulations of the Commission, and in the absence of any good cause being shown to the Commission why the granting of a license would not be in accordance with the provisions of this Act, the Commission shall thereupon issue a license to the applicant. For all other purposes of this Act, a construction permit is deemed to be a 'license'."

¹⁵ For example, 10 C. F. R. § 50.41 provides "additional standards" for Section 104 licenses, and 10 C. F. R. §§ 50.42 and 50.43 provide "additional standards" for Section 103 licenses.

¹⁶ 42 U. S. C. § 2235, "Construction Permits".

[6947]

The issuance of a construction permit is to be accorded the same procedural safeguards of hearing and notice to interested persons under Sections 182 and 189a.¹⁷ of the statute as in the case of an operating license. Although Intervenor claim that the Commission may not consider the granting of a construction permit and the granting of a license as two separate proceedings subject to substantially different results,¹⁸ that procedural similarity only was intended between permits and licenses is clearly indicated in the entire legislative history of Section 185.¹⁹ In recognition of this point, our rules are designed to provide for Commission determination of the form and scope of a

¹⁷ 42 U. S. C. § 2239(a), which provides:

"In any proceeding under this Act, for the granting, suspending, revoking, or amending of any license or construction permit, or application to transfer control, and in any proceedings for the issuance or modification of rules and regulations dealing with the activities of licensees, and in any proceeding for the payment of compensation, an award or royalties under sections 153, 157, 186 c., or 188, the Commission shall grant a hearing upon the request of any person, whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding. The Commission shall hold a hearing after thirty days' notice and publication once in the Federal Register on each application under section 103 or 104 b. for a license for a facility, and on any application under section 104 c. for a license for a testing facility."

¹⁸ Post-Hearing Brief of Intervenor, pp. 18-19.

¹⁹ On several occasions during Congressional consideration of the statute, Section 185 was sought to be amended by adding, at the end thereof, "and no construction permit shall be issued by the Commission until after the completion of the procedures established by section 182 for the consideration of applications for licenses under this Act", 1 Leg. Hist. 1168, 1178, 1209. The proposed language appears to have had

[6948]

construction permit preliminary to a Section 104 license as

¹⁹ (cont'd) its basis in a criticism of Section 185, as reported out by the Joint Committee, S. Rep. No. 1699, *supra* n. 10 at 84, 1 Leg. Hist. 832, and as

finally enacted, made by Representatives Price and Holifield, *ibid.* at 123, I Leg. Hist. 871: "Section 185, providing for the issuance of construction permits to applicants whose applications are otherwise satisfactory to the Commission, should be specifically *subject to the same procedural safeguards, assuring interested parties full opportunity for notice, hearings, and appeal before issuance, as are provided in connection with the issuance of licenses under section 182.* We believe that the section should be amended to make the *same procedure* specified in section 182 mandatory before construction permits are issued." (Emphasis added.) The same emphasis on procedural similarity between a construction permit and license was made by Representative Holifield in proposing the amendment on the House floor, 100 Cong. Rec. 10397-98 and 10406, III Leg. Hist. 2848-49 and 2857. However, the amendment was apparently never considered or voted upon by the House, see 100 Cong. Rec. 11368-72, III Leg. Hist. 2953-57. A similar amendment was presented on the floor of the Senate by Senator Humphrey, who stated that "at the time I drew up this amendment I was not aware of the modifications which had been made to section 182 and also to the judicial review section. * * * [U]nder the terms of the bill, as amended, the construction permit is equivalent to a license. In other words, . . . under the bill a construction permit cannot be interpreted in any other way than being equal to or a part of the licensing procedure. * * *" (100 Cong. Rec. 11566, III Leg. Hist. 3759) Senator Hickenlooper, sponsor of the bill in the Senate, responded that (1), by virtue of certain amendments to Sections 182 and 189 providing for application of the Administrative Procedure Act and other procedural changes to both construction permits and licenses, the amendment was not essential and (2), in the words of Senator Humphrey, "the revised sections on judicial review and on hearings and the revised Section 182 on license application all apply directly to construction permits" (100 Cong. Rec. 11566, III Leg. Hist. 3759). Senator Hickenlooper was referring to an amendment to Section 189 which was approved on the floor of the Senate to provide for a formal hearing in proceedings involving the grant of a license or construction permit (100 Cong. Rec. 10171, III Leg. Hist. 3175); and subsections (b) and (c) of Section 182 (since 1957, subsections (c) and (d)), which were added by the Joint Committee to the Committee print of H. R. 8862, and S. 3323 dated May 21, 1954 (I Leg. Hist. 257, 330-31), incorporated in H. R. 9757 as introduced

[6949]

appropriate in a particular case, depending upon the particular state of research and development currently available to the proposed project.

2. Regulations

Certain portions of our regulations have a bearing on the safety and financial issues in this case. The basic statement of the standards under which the Commission will issue both licenses and construction permits is Section 50.40 of our regulations.²⁰

¹⁹ (cont'd) June 30, 1954 (I Leg. Hist. 541, 625-27), and passed by the House (100 Cong. Rec. 11369, III Leg. Hist. 2954). The same end sought to be achieved by the Humphrey proposal was provided in the statute, as enacted, that is, a construction permit may only be issued upon public notice and hearing under the Administrative Procedure Act in the same manner as licenses are processed.

²⁰ 10 C. F. R. § 50.40, "Common Standards," which provides:

"In determining that a license will be issued to an applicant, the Commission will be guided by the following considerations:

"(a) The processes to be performed, the operating procedures, the facility and equipment, the use of the facility, and other technical specifications, or the proposals in regard to any of the foregoing collectively provide reasonable assurance that the applicant will comply with the regulations in this chapter, including the regulations in Part 20, and that the health and safety of the public will not be endangered.

"(b) The applicant is technically and financially qualified to engage in the proposed activities in accordance with the regulations in this chapter.

"(c) The issuance of a license to the applicant will not, in the opinion of the Commission, be inimical to the common defense and security or to the health and safety of the public."

[6950]

Under that regulation, where a construction permit for a developmental facility is involved, the Commission must be assured that (a) the *construction* of the facility will not endanger the health and safety of the public, (b) the applicant for the permit is technically and financially qualified to engage in the proposed *construction*, and (c) the issuance of the permit for *construction* will not involve acts inimical to the common defense and security or to the health and safety of the public.

Special standards for construction permits are provided in Section 50.45 of our regulations, which standards again emphasize that, under the statute, a construction permit is a step toward a license rather than the equivalent thereof.²¹ Actual issuance of a construction permit, as well as of a license, is covered by Section 50.50.²²

²¹ 10 C. F. R. § 50.45, "Standards for Construction Permits," which provides: "An applicant for a license or an amendment of a license who proposes

to construct or alter a production or utilization facility will be initially granted a construction permit, if the application is in conformity with and acceptable under the criteria of §§ 50.31 through 50.38 and the standards of §§ 50.40 through 50.43."

"10 C. F. R. § 50.50, "Issuance of Licenses and Construction Permits," which provides: "Upon determination that an application for a license meets the standards and requirements of the act and regulations, and that notifications, if any, to other agencies or bodies have been duly made, the Commission will issue a license, or if appropriate a construction permit, in such form and containing such conditions and limitations including technical specifications as it deems appropriate and necessary."

[6951]

Under Sections 50.23²³ and 50.56²⁴ the Commission will convert the permit to an operating license upon completion of construction, satisfaction of all the conditions of the permit, and "in the absence of good cause shown to the contrary." The regulation most vitally involved in the present proceeding is Section 50.35,²⁵ which provides:

"Extended Time for Providing Technical Information. Where, because of the nature of a proposed project, an applicant is not in a position to supply initially all of the technical information otherwise required to complete the application, he shall indicate the reason, the items or kinds of information omitted, and the approximate times when such data will be produced. If the Commission is satisfied that it has information sufficient to provide reasonable assurance that a facility of the general type proposed can be constructed and operated at the proposed location without undue risk to the health and safety of the public and that the omitted information will be supplied, it may process the application and issue a construction permit on a provisional basis without the omitted information subject to its later production and an evaluation by the Commission that the final design provides reasonable

²⁰ 10 C. F. R. § 50.23, "Construction Permits," which provides, in pertinent part: "A construction permit for the construction of a production or utilization facility will be issued prior to the issuance of a license if the application is otherwise acceptable, and will be converted upon due completion of the facility and Commission action into a license as provided in § 50.56."

²¹ 10 C. F. R. § 50.56, "Conversion of Construction Permit to License; or Amendment of License," which provides: "Upon completion of the construction or alteration of a facility, in compliance with the terms and conditions of the construction permit and subject to any necessary testing of the facility for health or safety purposes, the Commission will, in the absence of good cause shown to the contrary issue a license of the class for which the construction permit was issued or an appropriate amendment of the license, as the case may be."

²² 10 C. F. R. § 50.35.

[6952]

assurance that the health and safety of the public will not be endangered."

3. *Application of Statute and Regulations*

The position of the Intervenor throughout this proceeding has been that issuance of the provisional construction permit to PRDC violated the Commission's own regulations and that, therefore, its issuance was illegal. This position was founded in large part on an interpretation of the statute and regulations to the effect that all the same findings as the Commission would have to make in order to issue a license must also be made in order to issue a constructional permit.²⁰ In other words, the Intervenor maintain that, insofar as its factual foundation is concerned, the distinction between a construction permit and a license is only in the name, and that, unless there is sufficient foundation in the record now for the issuance of a license to operate, the construction permit should be suspended, and construction must stop. With this interpretation we cannot agree.

There can be no doubt that public safety is the first, last, and a permanent consideration in any decision on the is-

suance of a construction permit or a license to operate a nuclear facility.

²⁶ Although the Intervenor has excepted to this statement (Exception 2 and Supporting Brief, pp. 10-11; see Exceptions 3 and 8 and Supporting Brief, pp. 15-17), the record establishes that the Intervenor's argument left no other alternative (Post-Hearing Brief of Intervenor, pp. 16-17, 19, 42-43, and 59; Oral Argument, pp. 28-30). For example, the Intervenor argues that "the conditions of a construction permit should be the same as the conditions of an operating license" (Post-Hearing Brief, p. 17).

[6953]

As we emphasized in our initial decision, the Commission regards the importance of public safety so highly that it considers that it does not lose jurisdiction of this subject even after a license has been issued, at any stage in the course of its construction, or, for that matter, even after a facility is in operation.²⁷

Section 185 of the 1954 statute clearly contemplates that not all the information necessary for issuance of an operating license is required for a construction permit. The section provides explicitly for the "filing of any additional information needed to bring the original application up to date" and for a determination by the Commission not only that the facility can be constructed and will operate in conformity with the application for the permit, but also that no good cause has been shown why the granting of a license would not be in accordance with the applicable provisions of the statute.

Read in conjunction with Section 104b., with its emphasis upon "the minimum amount" of regulation, and as administered under Commission rules, particularly Section 50.35, Section 185 clearly negates the synonymy of a provisional construction permit and a license to operate. The

very fact that the construction permit is referred to as the natural precursor of the license emphasizes the distinction between them, and

²⁷ See Act, Section 182a., 186a., 187, and 189a; 10 C. F. R. §§ 50.54(e), (f), (h), and (j) and 50.100.

[6954]

the distinction is well established in the systems of other administrative agencies.²⁸

Everyone agrees, including the Intervenor,²⁹ that there is no hazard to the public in the construction of the reactor beyond that which is inherent in any other heavy construction. The only question of hazard to the public clearly arises when the time arrives for the reactor to go "critical" after issuance of an operating permit. The issue as seen by the Intervenor, however, is that construction of the reactor inevitably means its operation in this case. This contention is based on the arguments that the heavy investment in the reactor always will generate irresistible pressure for its operation so as to protect the investment itself, and that it would be unfair to PRDC to permit it to make a multi-million dollar investment and

²⁸ Compare Sections 309 and 319, Communications Act of 1952, 47 U. S. C. §§ 309 and 319. Section 319(c) provides that, in cases where a construction permit is required, the protest procedure would be applicable only to the issuance of the construction permit and not to the subsequent issuance of the license; see H. R. Rep. No. 1750, 82d Cong., 2d Sess. 11 (1952). There is some procedural analogy between an AEC provisional construction permit and a preliminary permit to be issued by the Federal Power Commission for proposed hydroelectric development, 16 U. S. C. §§ 797(i); see *Delaware River Development Corp.*, 10 F. P. C. 540, 542 (1951).

²⁹ Oral Argument, pp. 47-48; Post-Hearing Brief of Intervenor, p. 59.

[6955]

then deny it a license to operate. As the Intervenor sees the problem, issuance of the license is always automatic—

virtually a ministerial act—once the provisional construction permit has been issued.

As we made clear in our initial decision, the Commission certainly does not so interpret the Act or its regulations. Indeed, proposals to so amend Section 185 as to achieve this result have conspicuously failed to influence the Congress.³⁰ Perhaps it may be argued that, in the case of small and relatively inexpensive research reactors of standard types, which have become virtually production line items, there is no great formal distinction between the first step construction permit and a second step licensing procedure. In each step there is the requirement of the Atomic Energy Act and the Administrative Procedure Act for a hearing on the record. Nevertheless, the experience of safety of these small research reactor, and the relatively minor consequences even if there were an accident, do not require the same degree of caution as is needed for a large, expensive, developmental power project such as that of PRDC.

³⁰ *Hearings Before Joint Committee on Atomic Energy on S. 3323 and H. R. 8862*, 83d Cong., 2d Sess. 113, 117-19, 226-27, 11 Leg. Hist. 1747, 1751-53, 1860-61 (1954). In recommending the deletion from Section 185 of the conditions precedent for issuance of an operating license after completion of construction under a permit, the Special Committee on Atomic Energy of the Association of the Bar of the City of New York stated, *ibid.* at 417, 11 Leg. Hist. 2051: " * * * Before granting a construction permit upon which a licensee may rely for the expenditure of substantial sums of money, the Commission should at the least determine whether the granting of a license would be in accordance with the provisions of the act. It is neither feasible nor fair for the Commission to postpone decision on so fundamental a question until after the work has been done and the money spent." The proposal has been put forward since passage of the statute, *Hearings Before Joint Committee on Atomic Energy on Development, Growth, and State of Atomic Energy Industry*, 84th Cong., 1st Sess. 258, 261 (1955).

[6956]

As we more fully discuss in Part II of this decision, PRDC has been on notice since before the first shovel of

dirt was moved that its construction permit is *provisional* upon further demonstration of many technological and financial facts, including the complete safety of the reactor. The Applicant has, in fact, stated on the record that it is going to proceed at first under only the construction permit so as to develop a background that will support assurance that the reactor can be operated in complete safety, and has stated its intention to seek operation authority only after all necessary facts have been assembled. Since PRDC has recognized the developmental nature of the reactor it is building and since it has expressly waived any commitment for an operating license³¹ (if there exists any of the type that the Interveners contend is implied by the construction permit), the possibility that the Commission would be in any way bound cannot be visualized. It would be hard to

³¹ Acker Narr. Test. 11-12, 29; Gorman TR 3836-38; Oral Argument, pp. 82-83; Brief for Applicant, pp. 86-87. PRDC counsel stated in oral argument, p. 83: " * * * If the change in the reactor design should be so great that PRDC and its member companies should be unable financially to meet it, then the alternative is not that we ask you [the Commission] to let us finish the reactor and operate an unsafe reactor, but that then the project should be liquidated. We would feel that in such a case we would not have lost the so-called investment by a long shot. We would have acquired a great deal of additional knowledge in this field which would be extremely valuable for the development of other fast-breeder reactors."

[6957]

imagine a case where an applicant would be less able to argue that he had been misled by previous favorable Commission action. Under the circumstances of this case, moreover, and in view of the wording of the provisional construction permit, it is perfectly clear that PRDC is assuming a substantial financial risk with its eyes wide open, and that the generation of any pressure from such ingredients would be quite absurd.

An operating license may be considered in light of the clear wording of the statute and on the basis of the legislative history as a logical, but not an automatic, sequel to the fulfillment of the conditions of the construction permit. We again emphasize in this decision, however, the importance of the present construction permit provisions requiring the demonstration of safety and of satisfying those conditions.

Our interpretation of the 1954 Act and regulations promulgated thereunder with respect to provisional construction permits is based upon the statutory wording, the legislative history and purposes of that statute, and the practical problems of administration which the Congress clearly intended the Commission to resolve. This interpretation is neither novel nor illegal, as the Intervenor argues.

[6958]

Contemporaneously with promulgation of the rules contained in Part 50, Congress was fully informed of the reasons and basis for, as well as the intended method of, procedures for the issuance of provisional construction permits. The development of power reactors furnishes a clear example of the type of comparatively untried and technical field wherein importance should be accorded "a contemporaneous construction of a statute by the men charged with the responsibility of setting its machinery in motion, of making the parts work efficiently and smoothly while they are yet untried and new", *Norwegian Nitrogen Products Co. v. United States*, 288 U. S. 294, 315 (1933).³²

Shortly before the rules contained in Part 50 of the Commission's regulations were finally promulgated, Mr. Harold L.

³² See *United States v. American Trucking Association*, 310 U. S. 534, 549 (1940); *North Arlington National Bank v. Kearny Savings and Loan Assn.*, 187 F. 2d 564, 566 (3d Cir. 1951), cert. denied, 342 U. S. 816 (1951); *Peck v. Greyhound Corp.*, 97 F. Supp. 679, 680 (D. C. N. Y. 1951). We are not here construing our regulations to include what an administrator, exercising his delegated power, might have covered by regulation but did not, particularly where civil or criminal sanctions are being applied under the disputed regulations to the substantial prejudice of the persons regulated, e.g., *Cole v. Young*, 351 U. S. 536, 546-47 (1956); *Peters v. Hobby*, 349 U. S. 331, 344-45 (1955); *United States ex rel. Accardi v. Shaughnessy*, 347 U. S. 260, 267 (1954); *Tobin v. Wagner Co.*, 187 F. 2d 977, 979 (2d Cir. 1951).

[6959]

Price, Director of the then Division of Civilian Application,³³ describe to the Joint Committee on Atomic Energy the proposed regulations with respect to construction permits, as follows:³⁴

" * * * The fact is that at the present stage of development, as you know, each of the reactors planned for construction is substantially unique. There are technical problems, hazards problems associated with each of these reactors on which answers have not yet been developed. This has made it impracticable for the Commission to prescribe in its regulations definitive standards relating to hazards evaluation. What we have done is to set up a procedure under which applicants can make their preliminary submissions to the Commission and then we would, so to speak, work along with them as fast as we are satisfied that the general design concept and the location of the facility appear to be all right. We would go ahead and issue a construction permit as the statute permits, which would have to be conditional, of course, conditioned upon their satisfying the various hazards problems that they will have to deal with.

"Very often this means that they have experimental and testing work to do. As fast as they complete that work and submit it to us, it can be approved and then the construction permit will mature into a license.

~~"The way the companies go about this, it is pretty clear that all of those matters will not finally be resolved until about the time the reactor is going into operation, because their designs will change, and they will run tests. But this will work out all right because, to the extent that the companies are satisfied that they can work out the answers to the hazards problems they develop, they are perfectly willing to go ahead with these conditional construction permits."~~

³⁵ The Division of Civilian Application has since been divided into a Division of Reactor Development and a Division of Licensing and Regulation, of which Mr. Price is the Director. Mr. Price was called as a witness in this proceeding by the Intervenor (TR 2833).

³⁶ *Hearings Before Joint Committee on Atomic Energy on Development, Growth, and State of Atomic Energy Industry*, 84th Cong., 2d Sess. 106 (1956).

[6960]

At the same hearings, Mr. Price discussed the development of standards for construction permits and licenses, in response to questions from the Joint Committee counsel:³⁵

"Mr. Norris: * * *

"You have listed in your work different types of reactors for which licenses have been applied, that is the boiling water reactor and the breeder reactor. Have you given any thought to having separate regulations for parts of the regulatory processes for each of these types of reactors?

"Mr. Price: We thought about it, and for the time being rejected it primarily for this reason: We are unable to develop any definitive standards for hazards evaluation in detail for any of these reactors yet because the technology has not developed to the point where we know the hazards answers on all of these types

* *Ibid.* at 132-33. At that hearing the statement of the Commission to the Joint Committee also discussed the problems raised by the difficulty of developing detailed safety standards applicable to construction permits and licenses for power reactors, *ibid.* at 173: "First, in order to provide a basis for designing and operating atomic energy facilities and equipment, the Commission must establish the standards which will be applied in determining whether the public is being protected. * * * Second, in developing an adequate regulatory program, it is necessary to provide standards, guides, and codes under which proposed design and operating procedures may be evaluated as to their adequacy in preventing accidents and in minimizing the effects of those which may nevertheless occur. * * * The development of definitive standards or codes in this area will depend mainly on the standardization of the facilities themselves. The complex safety problems of nuclear reactors are unprecedented. At the present time, *each proposed reactor is different in its major aspects from any other reactor. It is evident that the safety requirements for each reactor must be considered on an individual basis. It is possible now to develop only very general standards and guides for reactor safety.*" (Emphasis added.)

[6961]

of reactors. We figure that in this developmental period the hazards evaluation business, which is really the chief licensing problem, is going to be handled, or will have to be handled, pretty much on a case-by-case basis under some general standards which, of course, we do have. We really would not add anything to the value of the regulations or the procedure except length if we tried to spell out something separate for each type at the present time.

"Mr. Norris: Do you anticipate doing it in the future?

"Mr. Price: As the reactors are developed and prove out, and we begin to get standards in the sense of people wanting to build copies of them, then we will be at the point where we ought to consider doing that. Then we will have some definitive answers on the major hazards problems, and we will be able to spell out for each type of reactor what the basic hazards protection has to be. I do not believe it will be helpful to try to do it now.

"Mr. Norris: I would think that if you waited until you were reaching a carbon-copy stage you would be waiting until you were almost reaching a stage when reactors might be found to be of practical value.

"Mr. Price: *That could very well be.*" (Emphasis added.)

A more detailed description of the provisional construction permit procedure, and the reasons therefor, was given to the Joint Committee on Atomic Energy in 1958 by Dr. C. Rogers McCullough, Chairman of the Advisory Committee on Reactor Safeguards (ACRS), who was called as a witness in this proceeding by the Intervenor.³⁶

³⁶ At the time that he testified, Dr. McCullough also was Deputy Director for Hazards Evaluation of the Commission's Division of Civilian Application. With the creation of the ACRS on a statutory basis in 1957, Dr. McCullough has since served as Chairman of the Committee.

[6962]

The subject was introduced by Representative Holifield, who asked the following question of Dr. McCullough:³⁷

"I am going to ask you, how can you give a license for the construction of a reactor which has never been

constructed before and be sure that you are granting a safe license. I will apply this specifically to the experiments which have been conducted on the fast breeder type of reactor, the EBR1 which melted down as the result of an incident. The EBR2 which will be quite a larger size reactor, but along the same general principles, and which will not be finished until 1960, upon which the PRDC reactor plans to have its engineering based when it comes to the reactor stage.

"How can you in advance of certain experimental work on the EBR2, the completion of it and the operation of it for at least a reasonable length of time, justify clearing the PRDC for a full-scale reactor such as is contemplated?"

The following exchange then occurred:

"Dr. McCullough: Let me try to respond to your question. *In the construction stage of a new type reactor—and frankly, in all cases of large reactors I feel they are for all practical purposes new types—it is impossible to give a construction permit which then can be guaranteed to be converted into an operating license in my view.*

"The dilemma is that persons wishing to construct a reactor would like to know, before they commit large sums of money to construct, that they can operate. This is a perfectly reasonable point of view. So we have a dilemma here that you can't resolve.

"Representative Holifield: It can be solved?

"Dr. McCullough: We think it can be solved.

³¹ Hearings Before Joint Committee on Atomic Energy on Development, Growth, and State of Atomic Energy Industry, 85th Cong., 2d Sess. 120-22

(1958). Dr. McCullough also stated, *ibid.* at 112, that the ACRS "believes; in the present state of the reactor art, it is impossible to set up rigid or fixed criteria or definite standards because the exercise of judgment and flexibility is needed during the developmental era. Each case presents differences which must be resolved individually."

[6963]

"Representative Holifield: It can be solved except unless by prohibiting the large reactor until additional data is concerned is one way?

"Dr. McCullough: Yes.

"Representative Holifield: I do not bring it up from the standpoint of extending the argument, but from a real concern of how we are going to get on with the industry if we assume a position of waiting until everything is proven. You cannot get along with the industry that way it is obvious. So there has to be a calculated risk. But I am hoping that in the consideration of this calculated risk which is taken that the Safety Advisory Committee will recommend, to the best of their ability, every safeguard possible to not just assume the risk without also saying that there may be a risk, and if there is a risk here, how can we direct the engineering so that a safeguard is built concurrently with the building of the risk."

"Dr. McCullough: *This is the way we have tried to solve this problem: To give a construction permit, pointing out the areas that require further work, and so in a sense it is a conditional permit.*

"May I say that the words 'construction permit' may have misled us in some respects here. *The construction*

permit, when you want to put an addition on your house, has the concept that you have a complete description of what you are going to do before you get the permit. The construction permit in this reactor business is not the same thing.

“Representative Holifield: That is right.

*“Dr. McCullough: So what we have tried to do in the case of large reactors is to try to do it step by step and keep informed each step of the way. * * **

** * **

“Representative Holifield: Is it possible in the case of a reactor such as the PRDC for them to build certain parts of the reactor—I am not thinking about the building or foundations or the roof, but the reactor itself—when there is still a large area which is still in the realm of the unknown?

[6964]

“Dr. McCullough: There are two ways of approaching this. They could hold up on certain of the controversial—I am speaking technically now and unknown features is a better word—and the other thing they could do, if, in their technical judgment, they feel it is worthwhile, is to construct the particular part, realizing they may have to redo it. It is their money and I guess they can make that choice.” (Emphasis added.)

The issuance of a provisional construction permit to PRDC, which does not in any manner adversely affect the

health and safety of the public or that of the Intervenor, was effected pursuant to the regulatory scheme generally prescribed by the Congress in the Atomic Energy Act of 1954, as carried out under Commission rule. If the Commission had not adopted and used the procedure at issue in this proceeding, it would be disregarding the letter and spirit of the statute, applied to the practical problems of reactor development.

[6965]

II. ORIGINAL PROVISIONAL CONSTRUCTION PERMIT

Intervenor contend that the Commission erred in failing to find (1) that the issuance of a provisional construction permit on August 4, 1956, was illegal because no reasonable assurance of safety and financial qualifications existed at that time, and (2) that the Intervenor were denied a fair hearing because proof of such claimed illegality was not permitted to be included as an issue in the proceeding. Closely allied with these contentions is the Intervenor's claim that the Commission erred in refusing to suspend the construction permit as requested by the Intervenor.

After notice of the filing of the PRDC application was published June 27, 1956,³⁸ the Commission on August 4, 1956, issued a conditional or provisional construction permit (CPPR4) for the proposed project, reserved nuclear materials for use in connection therewith, but took no action with respect to a license to operate the plant.³⁹ After finding that PRDC and its associated companies were technically qualified to design and construct the proposed re-

actor, our provisional construction permit provided, in part (pp. 2-3):

"D.(1) There are identified areas of uncertainty regarding the hazards potential of fast neutron breeder reactors that must be investigated and resolved. From the current state of the technology applicable to such reactors it can be reasonably inferred that there may be other areas of uncertainty not yet identified and requiring investigation and resolution. * * *

²⁹ 21 Fed. Reg. 4687.

³⁰ 21 Fed. Reg. 5974.

[6966]

"(2) On the basis of information presently available, the Commission believes that the problems relating to the safety of operation of the PRDC reactor will prove to be of a kind that can be satisfactorily resolved within a reasonable time. There is some doubt whether they can be resolved in time to meet the schedule proposed by PRDC in its application [then December 1959] and it may turn out that further investigation beyond the program of investigation outlined by PRDC in its application will be needed.

"E. Although PRDC has submitted evidence of a commitment from certain banks for a loan of \$15,000,000 and has described its plan for obtaining additional financing from its member companies, the evidence submitted to date does not justify a finding with respect to the financial qualifications of PRDC and accordingly the continued effectiveness of this permit will be conditioned upon a further showing in this regard"

Among conditions of the construction permit were the requirements that PRDC "within twelve months . . . , submits sufficient information relating to its financial resources to enable the Commission to make a finding that the Company has adequate financial resources to meet the requirements of the law and the regulations",⁴⁰ and that the Applicant submit a final Hazards Summary Report showing that "the final design [of the proposed plant] provides reasonable assurance . . . that the health and safety of the public will not be endangered by operation of the reactor in accordance with specified procedures."

The letter dated August 4, 1956, from the Director, Division of Civilian Application, to PRDC, stated, in pertinent part:

⁴⁰ Extended for an additional twelve months, by action of the Commission August 1, 1957.

[6967]

"As specified in the construction permit, prior to taking action on the conversion of the construction permit to a license to operate the facility a final Hazards Summary Report must be submitted to AEC for evaluation and a determination that the reactor can, in fact, be operated without undue risk to the health and safety of the public.

"As stated in the construction permit the Commission believes that the safety problems associated with the reactor will prove to be of a kind which can be resolved within a reasonable time. The Commission regards the fast breeder program as a very important program and will use its best efforts to assist the com-

pany to resolve these problems as completely and as quickly as possible. However, the Commission wants it to be clearly understood that in issuing this construction permit the emphasis is on the fact that it is a conditional one and that the Commission can make no commitment to convert the permit to a license until it is satisfied on all safety matters.

"Also, as you are aware, PRDC has not submitted to date sufficient information for the Commission to make a finding with respect to financial qualifications. Paragraph 3d of the permit contains a condition that its continued effectiveness will be dependent upon a showing within 12 months by PRDC that its financial resources are such as to enable the Commission to make the required finding, unless for good cause shown the Commission extends the time for submission of such data."

In our Order and Memorandum dated October 8, 1956, we designated certain issues for determination and denied the Intervenor's request for suspension of the provisional construction permit "without prejudice to ultimate determination by the Commission as to whether the permit should be continued, modified, or vacated." The issues for hearing, now relevant, concerned (A) (1) whether there was information sufficient to provide reasonable assurance that the type of facility proposed

[6968]

could be constructed and operated at the location proposed without undue risk to health and safety of the public, and (2) whether there was reasonable assurance that technical

information required to complete the application would be supplied; (B) whether the applicant was financially qualified to engage in the proposed activities and to receive an allocation of special nuclear material; and (D) what additional or different provisions, if any, should be incorporated in the permit.

In an order dated December 21, 1936, we also denied, among other things, a motion by the Intervenor to expand the issues for hearing to include the alleged illegality of the original issuance of the provisional construction permit. We construed the Intervenor's pleadings "as denials that there is presently a sufficiency of facts or information warranting issuance of the construction permit" and as raising questions of law to be considered by the Commission on brief after conclusion of the hearing.

As we have previously stated, this proceeding was not complete until opportunities for hearing had expired or, if, as here, a hearing was properly requested and allowed, such hearing was held. Although the Commission believed at the time it issued the original provisional permit that reasonable assurance of safety and financial qualifications had been or would be established, this belief was immaterial once the request for hearing was made, and safety and financial qualifications became

[6969]

an issue for the proceeding on the record. Even if the Commission had erred in issuing the original construction permit, such error would not be prejudicial to the Intervenor, because they were afforded every opportunity on the record to develop the safety and financial issues.

Intervenors contend that such alleged error, per se, vitiated the entire course of the proceeding. Such a rule, we believe, was never contemplated by Congress in providing for construction permit and licensing proceedings under the Atomic Energy Act of 1954, would have undesirable results, and would be contrary to the public interest, where such interest is adequately protected by the proceeding here involved. In any such proceeding the public interest in obtaining reasonable assurance of safety and financial qualifications without undue hazard to the public, not the original granting of the permit, is the primary issue in the proceeding.⁴¹

Whether or not to suspend a construction permit pending the hearing or at the conclusion thereof was a matter exclusively within the discretion of the Commission, so long as the public interest and that of the Intervenors were not directly and

⁴¹ *Federal Communications Commission v. Sanders Brothers Radio Station*, 309 U. S. 470, 477 (1940); *National Labor Relations Board v. National Container Corp.*, 211 F. 2d 525, 531-37 (2d Cir. 1954); *N. L. R. B. v. Monsanto Chemical Co.*, 205 F. 2d 763, 764-65 (8th Cir. 1953); *Todd v. Federal Trade Commission*, 145 F. 2d 858 (D. C. Cir. 1944); see *Clarksburg Publishing Co. v. F. C. C.*, 225 F. 2d 511, 515 (D. C. Cir. 1955).

[6970]

adversely affected by the exercise of that discretion. No one, not even the Intervenors, contends that going forward with the construction of this project will result in any risk whatsoever to the health and safety of the public. We have balanced the possibly conflicting considerations between continuation of the construction of the project and suspension thereof. We believe the public interest in the development of the fast breeder reactor, the time to be saved in

proceeding with construction while the remaining technical and safety problems are being solved, and our responsibilities under the Atomic Energy Act of 1954 are better served by continuing the permit.⁴²

⁴²*Federal Communications Commission v. WJR*, 337 U. S. 265, 275-76 (1949); *Federal Broadcasting System v. F. C. C.*, 239 F. 2d 941, 944 (D. C. Cir. 1956); *Indiana-Ohio Local Service Case*, 2 Ad. L. 2d 827, 828 (C. A. B. 1952); see *Radio Corp. of America v. United States*, 341 U. S. 412, 419-20 (1951); *Mid-Florida Radio Corp. v. F. C. C.*, 248 F. 2d 755 (D. C. Cir. 1957).

[6971]

III. SAFETY AND FINANCIAL ISSUES

The vast majority of Intervenor's exceptions concern our findings in the initial decision with respect to safety and financial qualification. The principal factual issue in this proceeding is whether there is information sufficient to provide a reasonable assurance that a utilization facility of the general type proposed in the PRDC application can be constructed and operated at the location proposed therein without undue risk to the health and safety of the public. Subsidiary to this issue is whether there is reasonable assurance that technical information omitted from, and required to complete, the application will be supplied before issuance of an operating license. A careful evaluation of the entire record in this proceeding can only lead to an affirmative answer to all of these questions.

Many of the exceptions taken by the Intervenor to our findings and conclusions in the initial decision, particularly with respect to safety, rely upon isolated statements in the record by the experts who testified, which statements, if compared with all of the testimony of those and other witnesses, do not support the exceptions. Our decision

must be based on the substantial evidence in the record as a whole.⁴³ Even assuming

⁴³ *Federal Communications Commission v. Allentown Broadcasting Corp.*, 349 U. S. 358, 363-64 (1955); *National Labor Relations Board v. Injection Molding Co.*, 211 F. 2d 59 (8th Cir. 1954); see *Universal Camera Corp. v. N. E. R. B.*, 340 U. S. 474, 488-91 (1951).

[6972]

that conflicts in the testimony of the experts do exist, we must resolve such differences by an examination of all of the testimony and exhibits, particularly where the matters in dispute involve questions of expert judgment delegated by the Congress to the agency.⁴⁴

1. Description of Proposed Reactor

The proposed reactor is the largest of this particular type so far proposed to be erected in the United States. The design of the facility includes a core of uranium, a blanket of uranium surrounding the core,⁴⁵ a reactor vessel housing the core and

⁴⁴ *Radio Corp. of America v. United States*, 341 U. S. 412, 419-20 (1951); *Market Street Ry. Co. v. Railroad Commission*, 324 U. S. 548, 560-61 (1945); *State of New York v. United States*, 98 F. Supp. 855, 860 (D. C. N. Y. 1951), *aff'd*, 342 U. S. 882 (1951), *reh. denied*, 342 U. S. 911 (1952); *Steelco Stainless Steel, Inc. v. Federal Trade Commission*, 187 F. 2d 693, 695-96 (7th Cir. 1951); *Consolidated Royal Chemical Corp. v. Federal Trade Commission*, 191 F. 2d 896, 899-900 (7th Cir. 1951); *Hamtramck Radio Corp.*, 1 Ad. L. 2d 448, 449 (F. C. C. 1951).

⁴⁵ The core of the reactor is to be a cylinder approximately 30.5 inches in diameter by 31.2 inches high, consisting of uranium pins 27% enriched in the isotope U-235, clad in zirconium and held in square, stainless steel subassemblies. A blanket of uranium depleted in the isotope U-235 would surround this core and would comprise, with the core, a cylinder 78.5 inches in diameter and 67 inches long.

[6973]

blanket,⁴⁶ movable control rods,⁴⁷ primary sodium and secondary coolant systems,⁴⁸ biological shielding,⁴⁹ a vapor

containment shell, and various associated structures for such purposes as storage of new and spent fuel elements, waste storage, clean-up

"The reactor vessel and core would be housed in a reactor building, which in turn would be housed in a containment structure, 120 feet high and 72 feet in diameter, of welded carbon steel. The reactor vessel is welded, stainless steel, with a maximum thickness of 2 inches, 36 feet high, with a diameter, enclosing the core and blanket, of 9.5 feet in the lower section and of 14.5 feet in the upper section.

"The safety and control mechanism for the reactor core includes rods containing Boron-10, which reduces radioactivity by absorbing neutrons. These rods control the radioactivity in the core by their insertion into or withdrawal from the core, and they are designed so that, in the event of a mechanical or electrical failure, their magnetic grips will release them to drop into the core.

"The reactor is designed to be cooled, by 5000 cubic feet of liquid sodium, pumped by electric pumps upward through core and blanket, thence through three primary coolant loops to heat exchangers, and then back to the reactor vessel. A secondary coolant system consisting of 3 loops carries liquid sodium from the primary heat exchangers to the steam generators, where the heat contained in the liquid sodium is used to convert water into steam. The liquid sodium then returns to the heat exchangers for further heating. This dual system is provided primarily to prevent the chemical reactions which would take place if the radioactive sodium in the primary system reached the water in the steam generator.

"For biological shielding, as well as for other purposes, the reactor vessel would contain twelve inches of stainless steel inside the lower portion thereof, thirty inches of borated graphite between the lower reactor vessel and the primary shield tank, and a 3.5 foot concrete wall enclosing the reactor vessel and primary coolant system. A 7-foot concrete wall and five feet of concrete and steel flooring would enclose the lower reactor compartment.

[6974]

and storage of sodium and inert gas, general services, holding liquid wastes, drainage, breakwaters, and dikes.

Like all other contemporary power reactors, the fast breeder reactor is a device in which the energy of fission or uranium is converted into heat, which heat then is removed in such a way as to permit further conversion into electricity by means of conventional generator facilities.⁵⁰ This particular type of reactor is termed "fast" because it can utilize neutrons produced by the fissioning of Uranium-235 nuclei and moving at a speed of about 10,000 miles per

second.⁵¹ If a reactor is so designed that its non-fissionable Uranium-238 atoms in the core and blanket capture neutrons and therefore change into plutonium atoms at a rate greater than the rate at which the Uranium-235 atoms are fissioning, it is called a "breeder". The proposed

⁵⁰ "The nuclear reactor is an assembly containing fissionable material in an arrangement designed to sustain and control a nuclear fission chain reaction. Fission occurs when a nucleus of a fissionable element [Uranium-233 and -235 and Plutonium-239] captures a subatomic particle called a neutron. The nucleus then splits into two lighter nuclei (the primary fission products) and at the same time energy is released, largely in the form of heat. Also, with the fission of each nucleus, neutrons are emitted, 2 or 3 on the average. If at least one of these is captured by another fissionable nucleus, a fission chain reaction, accompanied by the continuous production of heat, becomes possible." *Atomic Energy Facts* 79 (GPO 1957)

⁵¹ If, however, the reactor employs as a "moderator", a material such as graphite, either ordinary or heavy water, or beryllium, which has the ability to slow down neutrons to a speed of about one mile per second without capturing those neutrons, and if the reactor employs those relatively slow moving nuclear particles in the chain reaction, it is called a slow or "thermal" reactor.

[6975]

PRDC reactor is so designed, and its conversion ratio is 1.20, or, in other words, it is designed to produce 20% more fissionable material than it consumes.

As in the case of any other power reactor at this stage of the art, in addition to the design features of the reactor which will be determined and demonstrated before the actual construction of the reactor, many other such features will be determined and demonstrated during its actual construction. This fact merely underlines the importance of the development of the first breeder reactor at an early date. As the Intervenor concedes, the fast breeder reactor is one of the promising types for development of electric power on a commercially feasible basis. Demonstration of the economic practicability of breeding would increase by many times the available reserves of nuclear fuel by

facilitating the conversion into plutonium and use as fuel of the Uranium-238 isotope which comprises 99.3% of the natural uranium resources in the world.

2. *Safety of Proposed Reactor*

The concept of a fast breeder reactor is not novel. Government interest in fast neutron systems goes back to at least 1945.⁵² In addition to applicant's proposed reactor, at

⁵² At that time both the Argonne National Laboratory (then, called the Argonne Forest Laboratory) and Los Alamos Scientific Laboratory submitted proposals to the Manhattan Engineering District (predecessor of the AEC) to design and construct one fast reactor by each laboratory. Both AEC and the United Kingdom have since then operated a number of small, uncooled critical assemblies and flexible critical experiments, and AEC has operated two fast reactors, "Clementine" (1946-52) and EBR I (1951-1955).

[6976]

least two other breeder reactors are presently programmed by the AEC, one of which became operational in November 1957 (EBR I, Mark III core) and the other of which (EBR II) is scheduled for completion of construction in December 1959. The United Kingdom⁵³ was scheduled to complete construction of a uranium-fueled fast breeder reactor with a load capacity of 60,000 thermal kilowatts at Dounreay, Scotland, in December 1958.⁵⁴

Three major problems relate to the operational safety of the fast breeder reactor. First, there is the possibility that such a reactor might have instabilities which could lead to a nuclear runaway. Second, there is the possibility that a fuel

⁵³ British data, including Dounreay data, is being and will continue to be made available to AEC pursuant to an agreement for exchange of detailed information under the U. S.-U. K. bilateral agreement.

⁵⁴ In addition to the foregoing reactors and critical experiments, general studies have been conducted, or are being undertaken, by AEC and APDA-PRDC in the areas of fuel element irradiation, sodium technology, theoretical and experimental analyses of meltdown problems, and containment calculations and experiments. There is considerable experience in the use of sodium and related materials as coolants. In general, contrary to intervenors' exception, these sodium systems have operated successfully and have demonstrated the ability to achieve satisfactory purity of sodium and to avoid significant corrosion.

[6977]

meltdown resulting from a nuclear runaway or a failure of coolant could release energies capable of breaching the various containment layers.⁵⁵ Third, there is the possible damage resulting from the leak of radioactive fission products in the event of such breaching.

The possibility of one of these accidents—or some other not now foreseeable—cannot be categorically excluded. If the statute and the regulations are to be interpreted, as the Intervenor implies, so that the Commission must be *certain* that such an accident will never occur,⁵⁶ then no developmental reactor could ever

⁵⁵ Possibility of meltdown of the core of a fast breeder reactor arises because such reactors contain substantially more enriched U-235 than thermal reactors of equivalent power. Geometrically dispersed in the core to provide passage of coolant, which comprises nearly 50% by volume of the core, fissionable material, if assembled with sufficient rapidity, would explode. Although such an explosion would not have the force of an atomic bomb and in itself would not represent a hazard to people off the reactor site, the explosion conceivably could generate sufficient force to breach the various containment layers and thus release fission products to the atmosphere. Information presently available does not exclude the possibility that a meltdown and reassembly of the core could release energies capable of effecting such results. An extensive program to investigate further the possibility of a nuclear meltdown, the course which it would follow, and the energies which could result, as well as the further strengthening of the containment structures, has been undertaken by Applicant and the AEC.

⁵⁶ See, e.g., Post-Hearing Brief of Intervenor, p. 42 ("the record does not demonstrate that there cannot be a meltdown of the PRDC reactor"), p. 43 ("possibility of simultaneous failure of both mechanical controls and human controls cannot be excluded") and p. 49 ("still uncertain that the proposed containment shell will not be breached in a meltdown").

[6978] :

be built under a construction permit or operated under a license. The very fact that Section 104 of the Atomic Energy Act of 1954, under which developmental reactors can be licensed, is in the statute reveals that such a standard was never contemplated. As we emphasized in our initial decision, the concept of reasonable assurance of safety must be sensibly, though severely, applied.

The two types of instability which may be encountered in fast reactors—autocatalytic⁵⁷ and resonance⁵⁸—are believed capable of handling by design features. Proposed experiments.

⁵⁷ The stability of a reactor is essentially a matter of its power and temperature coefficients. If an increase in the temperature or power of the reactor tends to increase its reactivity—and hence increases its power—a vicious circle is created in which a power excursion, once started, tends to multiply itself. The reactivity of a reactor depends on its "multiplication factor", the number of nuclear fissions produced on the average by the neutrons resulting from one nuclear fission. If the multiplication factor (normally referred to as " k ") is 1, the power is steady; if greater than 1, the power will decrease. The difference, $k-1$, is called the "reactivity" or sometimes the "excess reactivity" of the reactor. Reactivity is usually controlled by rods which can be moved in and out of the reactor, the rods either absorbing neutrons, cutting down the amount of fissionable fuel by removal of such fuel from the core, or permitting the escape of neutrons by moving the reflector. The terms "temperature coefficient" and "power coefficient" are used, respectively, to describe the effect on reactivity of changes of temperature and power. A positive temperature or power coefficient is one with which an increase in temperature or power produces an increase in reactivity, thereby causing a further increase in power. A negative coefficient is one with which an increase in temperature or power decreases reactivity and hence power. A reactor having significant positive temperature coefficients is termed autocatalytic. A reactor having suitable negative coefficients is considered inherently stable.

⁵⁸ Resonance may be defined as oscillations in power level which result from the interaction of slow and fast acting power coefficients. It is generally believed that resonance effects will be suppressed by substantial prompt negative power coefficients. Existence of such resonance effects does not present a safety hazard as serious as an autocatalytic effect.

[6979]

should determine whether or not bowing inward of fuel elements, thus increasing the density of the core and hence

reactivity, is responsible for a positive temperature coefficient in breeder reactors. It is highly probable—and the Intervenor do not dispute—that bowing can be prevented by proper mechanical design.

Apart from these problems, and as the Intervenor concede, fast reactors are generally considered to be as easy to control as thermal—or “slow”—reactors. Indeed, it is possible to operate a fast reactor with a relatively small amount of excess reactivity available, thereby ensuring that an accidental sudden withdrawal of all controls will not result in a dangerous nuclear runaway. PRDC proposes, at least during the early years of operation, to adhere to such a limitation of excess reactivity.

Contrary to the Intervenor's argument, the spectrum of expert testimony on the safety of the proposed PRDC design was surprisingly narrow. The report of the Advisory Committee on Reactor Safeguards⁵⁹ can be literally accepted by the Commission,

⁵⁹ The ACRS report is contained in a letter dated June 6, 1956, from Dr. McCullough, Chairman of the Committee, to the AEC General Manager. The conclusions of the report are:

“1. Even though there are no facts or calculations available to the Committee that clearly indicate that the proposed reactor is not safe for this site, the Committee believes there is insufficient information available at this time to give assurance that the PRDC reactor can be operated at this site without public hazard.

[6980]

as it was by many of the witnesses and the Intervenor, as meaning that the state of human knowledge at the time the report was prepared would not support an *absolute guarantee* that there would be no safety problem in the operation of the reactor. But it equally well permits the

conclusion that going forward with the construction phase of this project would, by the very nature of the information developed in the course of evolving design, help to remove doubt concerning safety and would tend to provide an increasingly firm foundation for the reasonable assurance required by the statute that the project could be *operated* without undue risk to public health and safety.

Witnesses for PRDC, employees of APDA, stated categorically not merely that the safety of the reactor type was fully established but that existing information, plus what would be

²⁰ (cont'd). "2. It appears doubtful that sufficient experimental information will be available in time to give assurance of safe operation of this reactor unless the present fast reactor program of the AEC is amplified and accelerated as detailed below.

"3. It is impossible to say whether or not an accelerated program would give sufficient information to permit safe operation of this reactor at the Lagoon Beach site on the time schedule presently proposed." The report then recommends a program of investigation "to judge the safety of the proposed operation."

[6981]

learned from start-up tests on the PRDC reactor, constituted all the information necessary to establish that the specific reactor proposed could be safely operated. According to Dr. Hans A. Bethe, Professor of Physics at Cornell University and APDA consultant (Narr. Test. 60-61):

"By the application of theoretical physics to what we now know, it is my opinion that a fast breeder reactor of the general type proposed by PRDC can be constructed and operated in a populated community without undue risk to the public, and that it can be demonstrated, when such reactor has been built, that its operation is safe.

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" . . . [I]t is my further opinion that such additional information will in fact show, with very high probability, that a reactor constructed in accordance with the present PRDC design can be safely operated. Even if the planned investigations should not demonstrate safety on the basis of the present design, they will at least substantially eliminate areas of uncertainty and point the way to changes in particular features of the design so as to assure safety. The design of the PRDC reactor is sufficiently flexible to accommodate such changes."

Although he was "not aware that there is sufficient evidence or information in the record of this hearing to permit a reactor of this general type to be operated today at this particular site", Dr. McCullough, ACRS Chairman, stated that "[i]f this experimental program is carried out in sufficient detail, I think it is very probable that the necessary information will be obtained" (TR 3006-07). Another ACRS member, Dr. Manson Benedict, Professor of Nuclear Engineering, Massachusetts Institute of Technology, expressed "guarded optimism" towards the PRDC project, with a

[6982]

belief in "a strong probability that the test programs, theoretical analyses and design studies described in the hearings will lead to a reactor which can be safely operated at this site" (Narr. Test. 16). An ACRS member, Dr. Harvey Brooks, Professor of Applied Physics and Dean of the Department of Engineering and Applied Physics, Harvard University, and Chairman of the ACRS sub-

committee appointed to follow the progress on the design of the PRDC reactor, described his opinion as follows (Narr. Test. 3839):

"In conclusion, I believe that in all probability a fast breeder reactor of the PRDC design can be operated in a populous location such as the proposed Lagoon Beach site without undue hazard to the health and safety of the public. I do not believe that the presently existing supporting data are sufficient to give us the kind of confidence we ought to have to permit a project of this magnitude to be operated. I do believe, however, that adequate theoretical and experimental programs are now under way or proposed to furnish the further information required and that, assuming adherence to the time schedules which have been testified to, such information should be available in time to meet the proposed PRDC time schedule. Accordingly, I feel that there is reasonable assurance that the technical information needed to complete the license application will be supplied, insofar as that information relates to the matters covered in my testimony. I further believe that, barring unanticipated surprises, the information which will be obtained by these programs, including the PRDC start-up procedure itself, will furnish reasonable assurance that the PRDC reactor can be operated at a site such as that proposed without undue hazard to the health and safety of the public."

Other members of the ACRS, as well as an expert witness from the AEC staff, testified to substantially the same effect.

[6983]

It is in the nature of reactor design, although certainly not unique to it, that many features remain to be designed and demonstrated after construction is begun—and indeed some features redesigned and replaced after operation is under way—but there is reasonable assurance in the record that the solution of such problems as remain can be effected. As the late Dr. Mark Mills, former Associate Director and Head of the Theoretical Division of the University of California Radiation Laboratory and member of the ACRS, stated, “Practically all advanced technological developments take place with a sort of combined construction and research and development and necessary dovetailing of these things and it seems to me that just how this is done really pretty much has to be left up to the people doing it” (TR 3278).⁴⁰ Based on this record, there is nothing in the PRDC design as presently contemplated that is known to be inherently and immediately dangerous, no insoluble problems are presently identified, and construction of a prototype is not required because of the experimental work being done or to be done on problems affecting a fast breeder reactor of the PRDC type. However, until the questions raised by the ACRS have been answered to the satisfaction of the Commission, there will be no license to operate the PRDC reactor.

It is enough for the purposes of the present proceeding (that is, for the issuance of a provisional construction permit),

⁴⁰ See also Bethe (Narr. Test. 11): “* * * The simultaneous pursuit of programs of research, development and construction has become standard in the fast-moving field of atomic energy and is necessary in order to keep abreast or ahead of our competitors. * * *

[6984]

and for the satisfaction of the requirements of the statute and the regulations, that there be reasonable assurance that the reactor can be constructed and operated without undue risk to the health and safety of the public. We conclude that the present state of knowledge as described in the record gives, and the accident possibilities presented on the record do not negate, that assurance. We anticipate that the growth of present knowledge within a time reasonable in relation to the production schedule of the project will continue to strengthen the assurance.⁶¹

As we emphasized in our initial decision, the question of safety obviously cannot be considered without regard to proposed location.⁶² This record establishes reasonable assurance that the likelihood of any breach of the containment shell which PRDC proposes, designed as it is to contain an explosive which is equivalent to 600 pounds of TNT, a limit beyond any known accident possibility in the reactor, is extremely remote. The possible consequences in the event of such a rupture should still

⁶¹ Compare *Radio Corp. of America v. United States*, supra n. 42, 341 U. S. 427, wherein Justice Frankfurter, *dubitante*, stated, after challenging the Court's acceptance of the expert judgment of the F. C. C. that a compatible system of color television was not presently foreseeable and therefore the public interest required adoption of a non-compatible system: "Experience has made it axiomatic to eschew dogmatism in predicting the impossibility of important developments in the realms of science and technology. * * *"

⁶² The proposed site is located on the shore of Lake Erie, about 30 miles from the center of Detroit, Michigan, 25 miles from the center of Toledo, Ohio, 7½ miles from Monroe, Michigan, and 10 miles from the Canadian border. The site is bordered on one side by water and provides an exclusion

[6985]

not be ignored; however. If the containment structure failed to hold the fission products as the result of a nuclear

accident, the consequences would depend on the meteorological conditions at the moment as well as upon the nature of the fission products released. This problem is, of course, not unique to either the PRDC reactor or to fast breeder reactors in general. It applies to all types of reactors.

The evidence of record with respect to site gives reasonable assurance that the site is satisfactory from structural and underground water flow standpoints. The meteorology of the site is complex, but no reason appears in the record for it to be disqualifying. The site makes possible extensive safeguards against the inadvertent release of liquid contaminants.

The record shows that the applicant is well aware of its problem and is attempting to take all reasonable steps not only to prevent accidents, but also to curtail the consequences of an accident if there should be one. Studies of weather, hydrology, geology, and similar problems have yielded considerable information and are still in progress. Although the data of these types are not yet complete or conclusive, the record gives reasonable assurance that safe operation of the reactor will be as likely in that location as in any other location. We anticipate that knowledge to be acquired will fortify that assurance.

²² (cont'd) area on the land side with a minimum radius of 2900 feet. Population distribution for given radii from the site ranges from 175 people within one mile to 2 million people within 30 miles. During the summer months the population within 5 miles would be increased due to vacationing transients and crowded beaches.

[6986]

Pursuant to Section 50.34 (g) of the Commission's regulations, the Commission has invariably required, prior to

issuance of a license, that applicants must identify, and the Commission evaluate, the so-called "maximum credible accident", in order to determine whether the worst accident deemed credible can have hazardous consequences to the public.⁶³ A maximum credible accident is that combination of conditions the occurrence of which is considered credible and for which the consequences appear to be greater than those for any other credible accident. Although the maximum credible accident for the proposed reactor as presently designed has not yet been definitively established with respect to meltdown and the consequences of a breach of the containment structures, studies have been initiated which give reasonable assurance that such maximum credible accident will be identified and its consequences evaluated.

⁶³ 10 C. F. R. § 50.34(g): "Each application shall state the following technical information: * * * (g) An evaluation of the proposed measures and devices to prevent acts or accidents which would create radioactive hazards or to protect against the consequences should such acts or accidents occur".

[6987]

The degree of "reasonable assurance" with respect to safety that satisfies us in this case for purposes of the *provisional* construction permit would not be the same as we would require in considering the issuance of the *operating* license.⁶⁴ Even the Intervenor on oral argument seemed to acknowledge the differing degrees of certitude that the two situations would require.⁶⁵ We think that the form of our order adequately protects all participants in this proceeding, as well as the public interest, in providing for the filing and distribution of new information that will be examined in determining reasonable assurance

of safety when the time arrives for consideration of an operating license.

⁶⁴ Reasonable assurance means reasonable probability, established under the particular circumstances of the case in good faith and in the exercise of sound discretion and expert judgment, *Great Atlantic & Pacific Tea Co. v. Hughes*, 53 Ohio App. 255, 4 N. E. 2d 700, 705 (1935); see *Franklin Fire Insurance Co. v. Royal Mail Steam Packet Co.*, 54 F. 2d 807, 809 (D. C. N. Y. 1931); *American Brake Shoe & Foundry Co. v. N. Y. R. Co.*, 293 Fed. 612, 625 (D. C. N. Y. 1922); *Van Hook v. Southern California Waiters Alliance*, 328 P. 2d 212, 220 (Cal. App. 1958); *Rexnold v. Holloway*, 45 Ind. App. 36, 90 N. E. 87, 88 (1909).

⁶⁵ Oral Argument, p. 31.

[6988]

3. Financial Qualification

The Commission's regulations implementing Sections 182 a. and 183 of the Atomic Energy Act of 1954 make financial qualification an explicit condition to the issuance of a construction permit and ultimately an operating license, both with respect to engaging in the proposed activities⁶⁶

⁶⁶ 10 C. F. R. § 50.40(b), which states in pertinent part:

"In determining that a license [or construction permit] will be issued to an applicant, the Commission will be guided by the following considerations:

"(b) The applicant is technically and financially qualified to engage in the proposed activities in accordance with the regulations in this chapter."

10 C. F. R. § 50.33(f) requires that each application for a construction permit state "[t]he financial qualifications of the applicant to engage in the proposed activities in accordance with the regulations in this chapter. If the application is also for special nuclear material license pursuant to the regulations in Part 70 of this chapter, information should be included with respect to the applicant's financial qualifications to assume responsibility for the payment of Commission charges for special nuclear material." The latter requirement is covered by 10 C. F. R. § 70.23(e) which provides in pertinent part:

"A license application [for special nuclear material under Section 53 of the statute, 42 U. S. C. § 2073] will be approved if the Commission determines that:

"(e) Where the quantity of material requested, or the nature of the proposed activities are such as to require consideration of these factors by the Commission, that the applicant appears to be financially qualified to assume responsibility for the payment of Commission charges for use, consumption or loss

[6989]

and to receiving an allocation of special nuclear material.⁶⁷ With estimates of \$44,020,000 for the cost of construction, pre-construction and test operation, PRDC has assets aggregating

⁶⁷ (cont'd) of special nuclear material and to engage in the proposed activities in accordance with the regulations in this part. If the allocation of a substantial quantity of special nuclear material is requested, the application should demonstrate that the applicant appears to be financially able to undertake and carry out the proposed use of special nuclear material for a reasonable period of time.

⁶⁸ 10 C. F. R. §§ 50.60(b) and (c), which provide in pertinent part:

"(b) The request for incorporation of [provisions designating quantities of special nuclear material available for use by the facility] may be made simultaneously with the submission of an application for construction permit or facility license or at any time thereafter. Such request should be accompanied by at least the following information:

1) The applicant's financial qualifications to assume responsibility for payment of Commission charges for the materials, and to undertake and carry out the proposed use of special nuclear material for a reasonable period of time;

"(c) A request for the incorporation in a construction permit or license of provisions designating the amount of special material available for use by the facility will be approved by the Commission if:

(2) The applicant appears to be financially qualified to assume responsibility for the payment of Commission charges for the material and to undertake and carry out the proposed use of special nuclear material for a reasonable period of time.

[6990]

\$49,448,000 or an excess of \$5,428,000.⁶⁸ Applicant's fourteen public utility members⁶⁹ have combined equity assets of \$2 billion. Based upon past compliance with their commitments, their assets, and stated willingness to continue to support PRDC,

⁶⁹ These assets consist of \$27,448,000 in firm commitments for contributions from members of PRDC, the necessary regulatory approvals for which have either been obtained or waived by the contributors as not required by applicable law; \$7,000,000 in firm commitments from APDA in the form of cash, services, and equipment; and \$15,000,000 in long term bank loans, guaranteed by the 16 utility members of PRDC. As of July 1, 1957, \$4,000,000 of the bank loans had

been taken down. The \$7 million figure for APDA does not, however, reflect APDA's full financial contribution to the project, which is estimated at over \$18 millions. This contribution indicates actual expenditures of \$6,444,900 for the years 1954-1956 and budgeted expenditures of \$7,818,115 for 1957-1959, in addition to the cost of the component test facility estimated at \$4,131,700.

*Central Hudson Gas & Electric Corporation; The Cincinnati Gas & Electric Company; Potomac Electric Power Company; The Detroit Edison Company; Delaware Power & Light Company; Long Island Lighting Company; Rochester Gas and Electric Corporation; The Toledo Edison Company; Consumers Power Company; Columbus and Southern Ohio Electric Company; Philadelphia Electric Company; Southern Services, Inc., representing the Southern Company (Incorporated); Alabama Power Company; Georgia Power Company; Gulf Power Company; and Mississippi Power Company; Wisconsin Electric Power Company; and Iowa-Illinois Gas and Electric Company. Seven equipment manufacturers are also PRDC members: Burroughs Corporation; Combustion Engineering, Inc.; Fruehauf Trailer Company; Holley Carburetor Company; The Babcock & Wilcox Company; Westinghouse Electric Corporation; and Allis-Chalmers Manufacturing Company.

{6991}

there is reasonable assurance from the record that the member companies of PRDC will provide any additional funds, if necessary, to take care of adverse contingencies.⁷⁰

We, of course, recognize that there is a likelihood of a cost overrun on construction and research and development in connection with the PRDC project.⁷¹ However, we must reject again as unreasonable the contention of Intervenor 9 that PRDC can show financial qualification only if it is prepared to meet, with cash or assets in hand, a 25 percent overrun for all conceivable contingencies.⁷²

⁷⁰ *Columbia Empire Telecasters v. Federal Communications Commission*, 228 F. 2d 459, 460 (D. C. Cir. 1955); *Port Arthur College*, 14 R. R. 1234, 1249, 1254 (F. C. C. 1957); *Midland National Life Insurance Co.*, 4 R. R. 1269, 1294 (F. C. C. 1949); *Samoa Airlines Case, Reopened*, 18 C. A. B. 533, 538-39 (1954); *Parks Investigation Case*, 11 C. A. B. 779, 790-91 (1950); *Reopened Mississippi Valley and Southeastern States Cases*, 11 C. A. B. 979, 992-93 (1950). For cases in which applicants for C. A. B. certificates were found financially qualified because of the financial standing of their parent companies, which closely resembles the situation in this proceeding, see *American Export Airlines, Inc.*, 3 C. A. B. 294, 295, 297 (C. A. B. 1941); *Pan American Airways Co.*, 1 C. A. B. 118 (C. A. B. 1939); *South Pacific Air Lines, Inc.*, 17 C. A. B. 762, 769 (C. A. B. 1953).

⁷¹ Increases averaging between 5 and 75% already have occurred on specific items being ordered by APDA for PRDC or on labor and material expenses incurred by PRDC itself. The most pessimistic comment concerning possible

overrun was that given by the Commission's Assistant Chief, Engineering Branch, Division of Construction and Supply, who stated that the original PRDC estimate for "the nuclear portion of the project will cost several million dollars more than the \$32,400,000 estimated by PRDC" (Radley Narr. Test. 5-6), but who was not prepared to give any more definitive estimate of the overrun" (TR 3301-02).

⁷² *Atlantic Coast Broadcasting Corp.*, 26 F. C. C. 222, 230 (1959); *Great Lakes Television, Inc.*, 11 R. R. 845, 847-49 (1954), 25 F. C. C. 470, 512 (1958); *Iredell Broadcasting Co.*, 13 R. R. 996, 1001-1002 (1957); *Southeastern Enterprises (WCLE)*, 12 R. R. 578, 580 (1955), 13 R. R. 139 (1957).

[6992]

Applicant has submitted a statement of source and application of cash covering 10 years of operation, but major elements of PRDC's operating costs and revenues are, and can only be, speculative. This is inevitable in a project to construct a reactor of an advanced type for the purpose of demonstrating the practical value of such a facility. Indeed, one of the purposes of the project is to ascertain costs and revenues in the operation of such a reactor.⁷³

⁷³ The difficulties in connection with operating costs and revenues arise primarily with respect to matters controlled by AEC. As the only primary supplier and purchaser of plutonium, the Commission sets prices for the sale and buy-back of special nuclear material. We have guaranteed domestic plutonium prices until June 30, 1962, at \$44.20 per gram and for one year thereafter at \$30 per gram. The price to be paid to Applicant for reactor-produced plutonium after June 30, 1963, will depend on future Commission action, but we have announced that we expect "that the prices for plutonium will be reduced, as dictated by consideration of the value of the material for its intended use by the United States and giving such weight to the actual cost of producing the material as the Commission finds to be equitable, to a level based upon the fuel value of plutonium in commercial power reactor facilities" (22 Fed. Reg. 3985, June 6, 1957). Applicant estimates the sale price per gram at \$30 after June 30, 1963. The AEC's present estimate of the fuel value of that isotope is \$12 per gram, based on comparison with the Commission's charges for U-235. However, there is at present no experience with the use of plutonium as fuel, and it is uncertain what the fuel value will turn out to be ten years hence. PRDC's costs and revenues are also affected by other Commission prices and charges, particularly those for chemical processing, which are fixed until June 30, 1967, and fuel charges, which are not guaranteed.

[6993]

Intervenors would require, as one of the bases for financial qualification, that the applicant provide for, and have

available, resources, including binding legal commitments, for every conceivable contingency and for unanticipated events which may occur during the 25-year life of the proposed operating license.⁷⁴ Such construction of our statute and regulations is completely unrealistic, contrary to reasonable legal requirements for financial qualification,⁷⁵ and would make virtually impossible the construction of any developmental reactor.

⁷⁴ See particularly Post-Hearing Brief, pp. 50-57; Reply Brief, p. 30; Oral Argument, p. 49.

⁷⁵ *Southeastern Enterprises (WCLE)*, *supra* n. 72, 12 R. R. 581, wherein the protestant claimed lack of financial qualification based "upon conclusory arguments grounded on hypothetical situations and contingencies of the protestants' own making"; the F. C. C. later held, 13 R. R. 145. * * * [T]here is a sufficient showing that the station can be constructed and its operation commenced, and that is all that we require. The concept of public interest is not so exacting that it demands a licensee capable of sustaining great losses for long periods and pledged to do so. Were this not so, it is doubtful that many of the standard broadcast stations now authorized could have passed this test. * * * The concept of reasonable financial requirements is particularly applicable to projects involving "many novel innovations" in a field where there is little precedent and where Congress has directed the agency involved to foster development, *New York City Area Helicopter Service Case*, 15 C. A. B. 259, 264, 269-70 (1951).

[6994]

So far as the record shows, funds have been forthcoming from the members of PRDC on call, and there is no evidence to indicate this willingness to continue to support PRDC will cease. PRDC appears to be paying its bills, and its credit has not been indicated to be questionable.

It appears in the record that the utilities which have contributed to PRDC have so far had their payments allowed by the Commissions regulating them in their respective States as proper expenditures. All in all, the record shows that PRDC has assets available to it of nearly \$49,500,000, and this sum seems to be substantial evidence upon which to base a conclusion of financial responsibility.

We believe that the financial history of PRDC and the financial standing of its members are such that the increases in cost feared by the Intervenor's will be covered through the devices that PRDC has previously utilized. The Commission's regulations obviously do not require an applicant to have cash on hand to cover all possible contingencies of costs higher and revenues lower than estimates. On the basis of the financial estimates in the record, and even after making allowances for reasonable cost over-runs and revenue underruns, we are satisfied that the record establishes financial qualification to construct and operate the proposed reactor, to receive an allocation of nuclear materials, and to pay Commission charges and

[6995]

prices therefor for at least a reasonable time after scheduled start-up of the reactor, and certainly through the middle of 1963.⁷⁶ The Intervenor's argument and the Applicant's not too strenuous disagreement that the project is likely to be a financial failure for the PRDC membership does not refute it within the framework of the issues of this proceeding.⁷⁷

⁷⁶ *Saginaw Broadcasting Co. v. Federal Communications Commission*, 96 F. 2d 554, 562-63 (D. C. Cir. 1938): " * * * The question of financial qualification has at least two aspects: first, has the applicant enough resources to construct the station and to operate it for a brief period of time; and second, is there a reasonable likelihood of financial profit to be expected from the operation of the station, or are the applicant's personal resources such that he is able and willing to operate a station for a considerable period of time at a loss. * * *"; *The Enterprise Co.*, 9 R. R. 816, 818j-k (1954); *Brush-Moore Newspapers Inc.*, 11 R. R. 641, 658-59, 667 (1956); *Great Lakes Television Inc.*, *supra* n. 72, 11 R. R. 512; *Iredell Broadcasting Co.*, *supra* n. 72, 13 R. R. 1001; *Southeastern Enterprises (WCLE)*, *supra* n. 72, 13 R. R. 142, 144; see also *Frank D. Tefft Jr.*, 8 R. R. 179, 190 (1952).

⁷⁷ There is no question that "the first nuclear power plants will be uneconomic, regardless of design", statement of AEC Chairman, *Hearings Before Joint Committee on Atomic Energy on Development, Growth, and State of Atomic Energy Industry*, 84th Cong., 1st Sess. '6 (1955). The President of PRDC told

the Joint Committee at the same hearing, "... we must look upon the problem as a developmental one on which money must be spent for the ultimate results rather than for any expectation of immediate and direct financial return," *ibid.* at 228-29. In this connection, the *Report of the Panel on the Impact of the Peaceful Uses of Atomic Energy*, 84th Cong., 2d Sess. 37 (1956), stated: "... the prospects for profitable return on investment, at this stage of research and development, are admittedly not high. There are many risks uncommon to private industry which exist under the rules governing this stage of atomic-power development as set forth in law and as administered by the Commission."

[6996]

IV. OTHER PROCEDURAL ISSUES

In their exceptions Intervenor's have raised several other issues involving a claimed denial of fair hearing or violation of our regulations. In our disposition of these issues earlier in these proceedings and by this final decision, we have been and are keenly aware of our responsibilities under the Atomic Energy Act and the Administrative Procedure Act that all parties be accorded due process in accordance with the letter and spirit of those statutes.⁷⁸ At the same time, however, even assuming the validity of any issues raised by the Intervenor's in this case, the law does not require reversal of an initial decision or the remanding of a case to the Hearing Examiner unless the error complained of so affected the rights of the complainants as to constitute substantial prejudice and to deny them a fair hearing.⁷⁹

⁷⁸ See Sen. Doc. No. 248, 79th Cong., 2d Sess. 217 (1947).

⁷⁹ *Dolcin Corp. v. Federal Trade Commission*, 219 F. 2d 742, 746, 748-49 (D. C. Cir. 1954), rehearing denied, 219 F. 2d 751 (1954), cert. denied, 348 U. S. 981 (1955); *Union Starch and Refining Co. v. National Labor Relations Board*, 186 F. 2d 1008, 1013 (7th Cir. 1951); *Olin Industries, Inc. v. N. L. R. B.*, 192 F. 2d 799 (5th Cir. 1951); cf. *Reilly v. Pinkus*, 338 U. S. 269, 275-77 (1949), involving substantial prejudice in a Post Office Department fraud order proceeding where the right to cross examination of expert witnesses while on the stand was seriously inhibited.

[6997]

1. *Permissive Use of Direct Narrative Testimony*

At the formal prehearing conference, on motion of the Applicant, the Hearing Examiner ordered that the parties would be permitted to present direct testimony in narrative form, with or without exhibits, for identification, subject to objection by other parties and ruling by the examiner thereon and to cross examination of the witnesses involved. The Intervenor's contend that (1) no narrative testimony may be offered by any party in an AEC adjudicatory proceeding in place of oral testimony taken under oath, without the consent of all the parties to the proceeding, and (2) substantial prejudice was done to their right of cross examination of the witnesses who submitted narrative testimony because they could reach no conclusion concerning the veracity and credibility of the witnesses from direct examination.

Any lawyer who has participated in administrative hearings knows that there are two sides to the question of written direct testimony, but the complex technical and financial matters involved in this proceeding seem to us to make it an archetype of the arguments in favor of the written presentation of direct examination. No question whatsoever of "personal credibility evaluation" arises in this case.⁸⁰ The permissive order issued

⁸⁰ *Gamble-Skoamo, Inc. v. Federal Trade Commission*, 211 F. 2d 106, 112-14, 116-17 (8th Cir. 1954); *Attorney General's Manual on Administrative Procedure Act* 78 (1947).

[6998]

by the Hearing Examiner accords with the provisions of the Administrative Procedure Act⁸¹ and our Rules of Prac-

title,⁸² particularly the authority granted by statute and regulation for the Hearing Examiner to regulate the course of a hearing.⁸³

⁸² Section 7(e); 5 U. S. C. § 1006(c); see Sen. Doc. No. 248, *supra* n. 78, at 30-31, 208, 269-71, and 364-65; *Report of Attorney General's Committee on Administrative Procedure*, Sen. Doc. No. 8, 77th Cong., 1st Sess. 69-70 (1941); *Study of AEC Procedures and Organization in the Licensing of Reactor Facilities*, 85th Cong., 1st Sess. 21-22 (Joint Comm. Print 1957).

⁸³ 10 C. F. R. § 2.740, "Prehearing conferences", which provides:

"(a) In order to provide opportunity for the settlement of a proceeding or any of the issues therein, or for agreement upon procedural and other matters, there may be held at any time prior to or during a hearing, upon due notice of the time and place given to all parties, such conferences of the parties as, in the discretion of the presiding officer, time, the nature of the proceeding, and the public interest may permit.

"(b) Action taken at a prehearing conference may be recorded for appropriate use at the hearing in the form of a written stipulation among the parties reciting the matters upon which there has been agreement. The stipulation shall be binding upon the parties thereto."

⁸⁴ 10 C. F. R. § 2.733(c), (f), (h) and (k) which are based upon Section 7(b) of the Administrative Procedure Act, 5 U. S. C. § 1006(b).

[6999]

The procedure provided by our rules and used by the Hearing Examiner in this proceeding finds support in the rules of other agencies, agency decisions, and the studies of interested public groups.⁸⁴

2. Alleged "Warning" to AEC Consultants

Intervenors except to our finding that they were not denied a fair hearing because certain consultants of the Commission, who might have been called as witnesses, were officially advised of a possible conflict of interest. Intervenors categorize this action as a "warning" and as "intimidating prospective witnesses for Intervenors."⁸⁵

By letter to counsel for the Intervenors dated December 14, 1956, the Commission's Director of the Division of Civilian Application stated that (TR 1627-28):

* * * Commission consultants have been advised that the Commission interposes no objection to their voluntary appearance on behalf of any party to a formal hearing of the Commission.

* * * *

⁸⁶ *Argonaut Airways Corp.*, 3 Ad. L. 2d 709, 712-13 (C. A. B. 1953); F. P. C. Rule 1.20(h), 18 C. F. R. § 1.20(h); I. C. C. Rule 1.77, 49 C. F. R. § 1.77; C. A. B. Rule 302.24(b), 14 C. F. R. § 302.24(b); see, generally, *Final Report of the President's Conference on Administrative Procedure*, 13, 37-40, 66, 73, 80 (1955); Second Hoover Commission, *Report on Legal Services and Procedures* 68-71 (1955); Second Hoover Commission, *Task Force Report on Legal Services and Procedure*, 191, 199-201 (1955).

⁸⁷ Post-Hearing Brief of Intervenors, pp. 22, 25.

[7000]

"However, the Commission has advised its consultants that voluntary appearances might involve a conflict of interest in their activities as consultants with the Commission and that they may wish to consult private counsel in this respect."

To this letter counsel for the intervenors responded that, among other things, the "Commission had gone far out of its ways to suggest the possibility of prosecution for violation of the conflict of interest laws."⁸⁶

The Commission did not, and of course could not, threaten criminal prosecution of witnesses, although Commission consultants are required by statute to take cognizance of the conflict of interest laws of the United States.⁸⁷ Conflict of interest has a broader connotation than that which the Intervenors

⁸⁸ *Ibid.* at 23. In that brief, counsel also stated that Intervenors did not call any Commission consultants because they "were unwilling to subject them to retaliation by compelling them to testify under subpoena," *ibid.* at 25. At the hearing counsel also stated that he "had planned to call several of the witnesses he [AEC staff counsel] has named, but in view of the fact that he [AEC staff counsel] is going to call them I forewent my intention to call them" (TR 2698-99).

"Section 163 of the Atomic Energy Act of 1954, 42 U. S. C. § 2203, provides, in pertinent part: "[T]he members of advisory boards . . . may serve as such without regard to the provisions of sections 281, 283, or 284 of Title 18 of the United States Code, except insofar as such sections may prohibit any such member from receiving compensation in respect of any particular matter which directly involves the Commission or in which the Commission is directly interested." (Emphasis added.)

[7001]

would appear to acknowledge, and the regulations of the Commission with respect to personnel, including consultants, so provide.⁸⁸ We fail to find in the record evidence that Intervenor could not obtain expert witnesses⁸⁹ because of the Commission's reasonable and lawful concern with any appearance of conflict of interest.

⁸⁸ Sec. 4124-032 of the AEC Manual provides: "Conflict of Interests. Employees (including consultants and designees) shall avoid situations which require or appear to require a balancing of private interests or obligations against official duties." (Emphasis added.)

Sec. 4139-16 of the Manual provides: "Conflict of Interests. A consultant or designee should not be engaged in any case where it appears that his private activities and interests are inconsistent with services for AEC. In all cases where there is an actual or probable conflict, the contract instrument should not be executed. (See Chapter 4124, 'Conduct of employees'.) At the time of the appointment of each consultant and designee, copies of AEC Manual Chapter 4124, 'Conduct of Employees,' and 4139, 'Employment of Consultants and Designees,' shall be transmitted to him and his attention shall be directed to the sections which deal with conflicts of interests." The standard forms of contract for employment of consultants and designees (AEC Manual Appendix 4139-071-A through D) require each consultant and designer to certify that insofar as he knows "there does not exist any actual or potential conflict between his private interest . . . and his services for the Commission," and that he will "raise with the Commission any question regarding possible conflict of interests which may arise" as a result of a change in either his private interests or his services for the Commission.

⁸⁹ Compare *Highway Express Inc., Extension—Dangerous Explosives*, 1 Ad. L. 2d 828 (1. C. C. 1951), in which an applicant for a certificate to, among other things, carry explosives for the military failed to present Government witnesses with respect to the need for such service. In reversing a recommendation by the hearing examiner that the certificate be granted, the Commission stated, in part (829-30):

[7002]

3. Status of AEC Staff

The Intervenor claims that they were denied a fair hearing as a result of the Hearing Examiner's refusal at

the commencement of the proceeding to require AEC staff counsel to state its position on the issues specified by the Commission for hearing. Although no grounds are given for this exception, the position of the Intervenor, as set forth in previous briefs, appears to be that (1) by being required to proceed with cross examination and rebuttal of PRDC and AEC witnesses, and with the presentation of their own case, without knowledge of the position of the AEC staff, Intervenor was denied a fair hearing; (2) the proceeding did not involve initial licensing, and the staff was required to take a position under the Commission's Rules of Practice; and (3) "the entire hearing in this case was vitiated by the fact that AEC participated fully in the hearing without at any time stating its position."

(cont'd) " * * * It [motor carrier] also urges that we take official notice of the fact that it is impossible to get government officials to appear in support of motor carrier applications for operating authority.

"We are of the opinion that the evidence is insufficient to justify a grant of the authority sought. No public witnesses appeared in support of the application, and we know of no prohibition against duly authorized representatives of the various departments of the Government appearing in support of an application where the authority sought is required or deemed necessary by the appropriate authority."

"Post-Hearing Brief of Intervenor, p. 37.

[7003]

The role of the AEC staff was clearly stated on the record at the commencement of the proceeding, when staff counsel placed in evidence a letter from the AEC General Manager to the members of the staff participating in the proceeding. This letter stated in part (TR 33-37):

" * * * While section 5(c) of the Administrative Procedure Act requiring separation of functions does not apply to proceedings involving initial licensing, the Commission has felt that adopting the separation

of functions in its first formal hearing under the licensing program is desirable. *In the preparation and conduct of the proceeding, the separated staff will not be subject to supervision by persons not on the separated staff. This staff will not participate in advising the Commission with respect to its decision on the record established at the hearing except by briefs and other statements on the record.* * * *

"The separated staff will attempt in the public interest to insure that all relevant facts not brought out by the other parties are fully developed at the hearing. After the Power Reactor Development Company and the intervenors have introduced their respective cases into the record, counsel for the separated staff will introduce such additional evidence as appropriate to insure that an adequate and complete record is presented to the Commission as the basis for its decision.

. . . The separated staff will be free to take such position during the hearing and to make such recommendations and proposed findings to the Commission on the public record as it deems appropriate." (Emphasis added.)

The role of the separated staff in helping to develop a complete record for decision was the only proper one which such a staff could take in this proceeding, since the public interest was represented by them at the hearing.⁹¹ The staff was not

⁹¹ *United States v. Merchants & Manufacturers Traffic Association*, 242 U. S. 178, 188 (1916); *County Board of Arlington County v. United States*, 101 F. Supp. 328, 332 (D. C. Va. 1951); *United States ex rel. Chapman v. Federal Power Commission*, 191 F. 2d 796, 800 (4th Cir. 1951).

[7004]

required to take an adversary position with respect to the issues in the proceeding.⁹² The proceeding was initial licensing and represented a continuation of the proceeding initiated by issuance of the conditional construction permit, which, under the law and regulations in effect at the time of the permit's issuance, was required to go to hearing upon the filing of the interventions by the Intervenor.⁹³ The contention

⁹² Section 2.730 of our Rules of Practice, 10 C. F. R. § 2.730, provides: "The parties to a formal hearing shall be AEC, the licensee or applicant as the case may be, and any person permitted to intervene." Section 2.737, 10 C. F. R. § 2.737, provides that "[i]n appropriate cases AEC may file and serve a reply to the answer." Counsel for the Intervenor appears to have taken an inconsistent position on this point. In a letter to the Commission Chairman, dated December 31, 1956, with respect to the use of Commission consultants as witnesses, counsel stated that "this is not an action against AEC." Post-Hearing Brief, p. 23. With respect to the necessity for the AEC staff to take a position on the record at the commencement of the hearing, the Intervenor claimed that "the Commission is the real defendant in this proceeding," *ibid.* at 37.

⁹³ Under Section 189a. of the Atomic Energy Act, 42 U. S. C. § 2239(a), "the Commission shall grant a hearing upon the request of any person whose interest may be affected by the proceeding." Section 2.102 of our Rules of Practice, 10 C. F. R. § 2.102, provides:

"(a) The AEC will, upon request of the applicant or an intervenor, and may upon its own initiative, direct the holding of a formal hearing prior to taking action on the application. If no prior formal hearing has been held and no notice of proposed action has been served as provided in paragraph (b) of this section, AEC will direct the holding of a formal hearing upon receipt of a request therefor from the applicant or an intervenor within 30 days after the issuance of a license or other approval or a notice of denial.

[7005]

that failure to meet the demands of the Intervenor on this question vitiated the entire hearing is without merit.

4. Access to Restricted Data⁹⁴

Intervenor contend that they were denied a fair hearing because they did not have access to Restricted Data

when they refused to follow normal security clearance procedures. In support of their contention, they argue that (1) the Restricted Data to which access was sought related only to civilian applications of atomic energy unrelated to the common defense and national security; (2) the requested information has been published, and the Commission is required by statute to declassify the information; (3) it is impossible for the Commission effectively to control Restricted Data in the interest of national security, and consequently there would be no undue risk to the common defense and security in publishing the information or in granting Intervenor's request; and (4) the Commission has violated the First and Fifth Amendments of the Constitution by making Intervenor's access to Restricted Data contingent upon

⁹⁰ (cont'd) "(b) In such cases as it deems appropriate, AEC may cause to be served upon the applicant, and published, a notice of proposed action upon his application and shall cause copies thereof to be served upon intervenors or others entitled to or requesting notification. The notice shall state the terms of the proposed action. If a formal hearing has not been held prior to issuance of the notice, AEC will direct the holding of a formal hearing upon the request of the applicant or an intervenor received within fifteen days following the service of the notice."

[7006]

their attorneys' submission to the Commission's security requirements. The Intervenor's claim that Restricted Data constituted an essential part of the license application of PRDC, to which access was required by Intervenor's counsel in order to prepare their case, to cross-examine witnesses, and to introduce facts reflected therein in evidence.⁹⁴

All of these contentions were considered and disposed of by the Commission in its Order and Memorandum dated

March 4, 1957, in which we denied Intervenor's motion for access to Restricted Data without compliance with the Atomic Energy Act of 1954 and our regulations issued pursuant thereto.⁹⁵ As we pointed out in that order, Restricted Data is a special category of classified information created by our statute. It is not, as Intervenor claims, defense information within the meaning of, or to be handled according to the procedure of, Executive Order No. 10501.⁹⁶ Subject to criminal penalties under our statute and regulations,⁹⁷ access to Restricted Data is denied to any person until an appropriate investigation and report have been made thereon by the Civil Service Commission, and we have determined that permitting such person to have access to Restricted Data will not endanger the common defense and security.⁹⁸

⁹⁵ Post-Hearing Brief of Intervenor, p. 34.

⁹⁶ 6 Ad. L. 2d 891 (1957).

⁹⁷ 18 Fed. Reg. 7049 (Nov. 10, 1953).

⁹⁸ Section 227, 42 U. S. C. § 2277.

⁹⁹ Section 145b, 42 U. S. C. § 2165(b).

[7007]

Under "parallel procedures" authorized by statute,⁹⁹ our rules provide for making Restricted Data available to any party in the proceeding, his counsel or witnesses who have appropriate security clearances.¹⁰⁰ The fact that Restricted Data has been made available to numerous persons with appropriate security clearance does not mean that we have "published" such information and are therefore required to declassify the Restricted Data involved.

It is no denial of free speech under the First Amendment or due process under the Fifth Amendment, for the Commission to impose reasonable requirements for access to

information which Congress has specifically directed should be protected from disclosure to the general public, provided, as we do, security clearance for access is available on equal terms to all persons.¹⁰¹

⁹⁹ Section 181, 42 U. S. C. § 2231.

¹⁰⁰ 10 C. F. R. §§ 2.800-2.814.

¹⁰¹ In support of their claim of violation of the Fifth Amendment, Intervenor's cite *Lovell v. City of Griffin*, 303 U. S. 444 (1938) and *Grosjean v. American Press Co.*, 297 U. S. 233 (1936). Both cases are clearly distinguishable. *Lovell* involved a denial of the right to practice one's religion, and a violation of the liberty of the press, inhibited by a vague city ordinance. In *Grosjean* the Supreme Court upheld a decree of the District Court enjoining the enforcement of a state statute, a license tax on advertising in newspapers with large circulations, as violation of the freedom of press. Intervenor's claim that the Fifth Amendment was violated appears to be bottomed on the proposition, with which we agree that due process requires that Intervenor's have a reasonable opportunity to know the claims of the other parties, *Morgan v. U. S.*, 304 U. S. 1 (1938). No such denial of opportunity is presented in this proceeding, as was present in the *Morgan* case where the complainant therein was unable to ascertain at any time whatsoever during the course of an administrative proceeding what the claims of the agency, in opposition, were, 304 U. S. 16-19.

[7008]

The prejudice claimed by Intervenor's to the presentation of their case in this proceeding arises, if at all, not because of any action on the part of the Commission but solely because they refused to resort to reasonable procedures for security clearance, with due protection of their rights at the hearing while such clearance was being obtained. In effect, the Intervenor's refused to exhaust even the most preliminary of the reasonable administrative remedies afforded by the Commission with respect to Restricted Data. Finally, the large majority of the 73 documents sought by Intervenor's were declassified in whole or in part by Commission order.

5: Effective Date of Order

Intervenor's claim that the Commission "has committed a breach of its regulations by prematurely issuing what

appears to be a final order" attached to its Opinion and Initial Decision dated December 10, 1958. The rule referred to requires that an initial decision contain the "appropriate rule, order, sanction, relief, or denial thereof, with the effective date."¹⁰²

As Intervenors concede, there is nothing in the decision or order which postpones the effectiveness of the order in the event exceptions are filed. The opinion, initial decision, and order are clear that the latter was intended to be immediately effective. Our rules do not, as Intervenors claim, require us to postpone the effective date of the order where, as here, the public interest

¹⁰² 10 C. F. R. § 2.751(c)(4).

[7009]

and that of the Intervenors are protected by the terms of the order. A continuing review on the public record does not prejudice, but protects, those interests, particularly with respect to complete assurance of the safety of the proposed reactor. Making our order immediately effective further accords with our findings, to which Intervenors have not excepted, that (1) the fast breeder reactor is one of the promising types for the development of electric power on a commercially feasible basis, (2) the demonstration of the economic practicability of breeding would increase by many times the available reserves of nuclear fuel today, and (3), by proceeding with construction and further research and development simultaneously, rather than awaiting complete research and development results, Applicant will save several years in the time required to place in operation its power reactor.

[7010]

V. DISPOSITION OF EXCEPTIONS

Section 2.752 of our Rules of Practice requires that exceptions "shall designate by specific reference the portions of the record relied upon in support of the objections, and shall state the grounds for the exceptions including the citations of authorities in support thereof." In the absence of compliance with these conditions, "any objection to a rule, finding or conclusion . . . shall be deemed to have been waived, and the Commission need not consider such objections." The purpose of the rule, of course, is to afford the Commission an adequate basis on which to review the exceptions of a party and to insure that such review shall fairly include all the material points which the excepting party wishes to make.

The large majority of Intervenor's exceptions do not comply with the above rule. The Intervenor's supporting brief requests the Commission to reexamine all prior briefs and arguments in this proceeding "in connection with their Exceptions to the Opinion and Initial Decision."

Under such circumstances we would be justified in rejecting all of the exceptions which did not comply with our rules.¹⁰³ The

¹⁰³ *Kings Electronics Co., Inc.*, 4 Ad. L. 2d 557 (N. L. R. B. 1954); *Sucesion Luis Panallo-Castellanos*, 26 F. C. C. 109, 136 (1959); *Fort Worth Investigation* (C. A. B. Dkt. No. 7382, Dec. 16, 1957) (order striking exceptions to initial decision); see *Steelco Stainless Steel, Inc. v. Federal Communications Commission*, 187 F. 2d 693, 697 (7th Cir. 1951).

[7011]

practice of submitting exceptions without record references and citations of authorities cannot be condoned by

the Commission. Because of the important issues in this proceeding, however, we have previously considered in this opinion all of these unsupported exceptions.

The exceptions and objections of the Intervenor are overruled, as follows:

(1) Exceptions 1, 2, 3, 4, 5, 6, 7, 8, 15, 16, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, 30, and 32, with respect to safety, are overruled for the reasons set forth in Parts I and III-1 and -2 of our decision. Only exceptions 15, 18, 20, 21, 27, 28, 29, and 30 contain citations of authority.

(2) Exceptions 9, 10, 24, 25, 26, and 31, with respect to financial qualification are overruled for the reasons set forth in Parts I and III-3 of our decision. Exception 31 contains no citation of authority.

(3) Exception 11, with respect to the introduction of direct narrative testimony, is overruled for the reasons set forth in Part IV-1. The exception contains no citation of authority.

(4) Exception 12, with respect to claimed intimidation of AEC consultants, is overruled for the reasons set forth in Part IV-2. The exception contains no citation of authority.

(5) Exception 13, with respect to access to Restricted Data, is overruled for the reasons set forth in Part IV-4. The exception contains no citation of authority.

(6) Exceptions 33 and 34, with respect to the legality of the issuance of the provisional construction per-

mit, are overruled for the reasons set forth in Parts I, II, and III of our decision. The exceptions contain no citation of authority.

[7012]

(7) Exception 35, with respect to the AEC staff position, is overruled for the reasons set forth in Part IV-3. The exception contains no citation of authority.

(8) Exception 14 claiming that the operations of PRDC, if conducted under the provisional construction permit, will not be subject to the statute and our regulations, and the unnumbered exception claiming our order of December 10, 1958, to be erroneous, both without any citation of authority, are overruled for the reasons set forth in our entire decision.

(9) The Commission has considered all other points raised by the Intervenor in their briefs, oral argument, exceptions, and on the record and finds them to be without merit.

[7013]

VI. FINDINGS AND CONCLUSIONS

In addition to the facts found and conclusions of law reached in the course of the opinion, the Commission specifically finds and concludes:

1. Power Reactor Development Company (PRDC) is a duly organized non-profit corporation existing under the laws of the State of Michigan, and its operations will, if conducted according to the construction permit issued by

this Commission dated August 4, 1956, be subject to the Atomic Energy Act of 1954, amendments thereto and the rules and regulations issued by this Commission.

2. PRDC has proposed the construction and, subject to later proceedings, the operation of utilization and production facilities, as defined in Section 104 of the Atomic Energy Act and the rules of this Commission, as a research and development facility consisting of a fast breeder nuclear reactor of 300,000 thermal kilowatts and 100,000 electric kilowatts capacity and having physical features described in the application and the ten amendments thereto which constitute a part of the files and record of the proceeding.

3. PRDC has been issued a construction permit on a provisional basis to construct a fast breeder reactor of the

[7014]

general type set forth in its Application as amended prior to August 4, 1956. Developments in design resulting from improvement in technology require changes in and additions to some of the terms and conditions of the construction permit previously issued. These changes and additions are reflected in the amended construction permit attached hereto and made a part of our order.

4. AEC interest in fast neutron systems goes back several years. Both AEC and the United Kingdom have operated a number of small uncooled critical assemblies and flexible critical experiments. AEC has operated two fast reactors, "Clementine," a 25-thermal kilowatt plutonium-fueled reactor which operated from 1946-1952 and EBR-I,

a 1400 thermal kilowatt (200 electrical kilowatt) uranium-fueled reactor which operated at the National Reactor Testing Station, Idaho, from August 1951-November 1955. The following fast reactors, in addition to Applicant's proposed reactor, are presently programmed:

a. EBR-I is being placed back into operation with two new cores, Mark III and Mark IV. The Commission takes official notice that EBR-I with the Mark III core became operational in November, 1957.

b. EBR-II, a 62,500 thermal kilowatt (20,000 electrical kilowatt), uranium-fueled reactor, will be constructed at the National Reactor Testing Station in Idaho. The Commission takes official notice that funds for construction of EBR-II have been authorized and that construction of EBR-II is currently scheduled to be completed in December, 1959.

[7015]

c. A uranium-fueled reactor with a rated capacity of 60,000 thermal kilowatts was scheduled for completion of construction at Dounreay, Scotland, in December 1958.

5. Technology regarding fast breeder nuclear reactors is a rapidly advancing art, and utilization and production facilities that will permit the most complete use of fuel for atomic energy offer a substantial advancement in this field. The research and development project proposed by PRDC reflects the largest plant in the United States to date which would utilize energy produced by the fast breeder process. Information is increasing as experiments and

corroborative data are supplied regarding the safety in operation of such a plant. Several experiments with existing or proposed fast breeder reactor plants will provide information helpful in the consideration of the operation of the PRDC plant. There is no inherent hazard or danger to the health and safety of the public in the construction or operation of fast breeder reactors.

6. The EBR-II and PRDC reactors are similar in neutron spectrum and flux, power density, fuel element design and coolant operating conditions, but differ in a number of design aspects. Both are based on EBR-I. EBR-II has a more advanced design, and is intended as a flexible experimental facility.

7. The Dounreay and PRDC reactors operate in the same neutron spectrum and have many common characteristics, but also have many differences in detail.

8. Neither EBR-I, EBR-II, nor Dounreay can be considered a direct prototype of the PRDC reactor.

[7016]

9. There is considerable experience in the use of sodium and related materials as coolants, including investigations of sodium technology at Commission laboratories since 1945; operation of EBR-I, the submarine intermediate reactor, and the sodium reactor experiment at Santa Susana, California; and performance tests on mock-ups of the EBR-II sodium system. In general, these sodium systems have operated successfully and have demonstrated the ability to achieve satisfactory purity of sodium and to avoid significant corrosion.

10. Construction of the proposed PRDC reactor on the proposed time schedule represents a greater and more rapid extension of reactor technology beyond demonstrated practice than construction of the other civilian power reactors presently being completed in populated places.

11. The proposed experiments with the EBR-I, Mark III, core are intended to determine definitively whether bowing is the cause of the positive temperature coefficient observed in EBR-I. If properly carried out, they are expected definitively to establish the correctness or incorrectness of the bowing hypothesis.

12. It is highly probable that bowing can be prevented by proper mechanical design. Applicant has proposed three means of preventing inward bowing of the PRDC core.

[7017]

13. The record indicates considerable doubt about the cause of the resonance instabilities observed in EBR-I. They may be attributable to the use of series rather than parallel flow of the coolant through the core and blanket, and the experiments with the Mark III core are designed to test this hypothesis. The PRDC design proposes parallel flow.

14. Apart from certain problems of prompt acting positive temperature coefficients and resonance effects, the answers to which are not yet completely known, fast reactors are generally considered to be as easy to control as thermal reactors. Indeed, it is possible to operate a fast reactor with a relatively small amount of excess reactivity avail-

able, thereby ensuring that an accidental sudden withdrawal of all controls will not result in a dangerous nuclear runaway. PRDC proposes, at least during the early years of operation, to adhere to such a limitation of excess reactivity.

15. Although many questions remain to be answered regarding the problem of meltdown and disassembly or reassembly of the core or a substantial portion thereof, there is reasonable assurance that these questions will be answered in due course and in time for the answers to precede any decision of the Commission with regard to an operating license for the proposed PRDC reactor; and design modifications of the reactor may be available as a means of avoiding these problems.

[7018]

16. In view of the relative lack of operating experience with fast power reactors, additional satisfactory operating experience with such reactors prior to the commencement of operation of Applicant's proposed reactor will be highly desirable. Present schedules indicate that considerable operating experience with EBR-I and Dounreay, and possibly some with EBR-II, will have been obtained prior to the start of PRDC test operations.

17. It is possible that there may be presently unknown effects in large fast reactor systems. A prototype of the proposed reactor at a remote location has been urged as affording greater assurance against the possibility of such unknown effects than does the presently planned experimental and theoretical programs. The Commission finds that the necessity, however, for constructing such a proto-

type has not been shown. If the program of meltdown investigation should prove inconclusive, it will be necessary to reconsider the question of need for a prototype.

18. Based on the foregoing findings, and of this record, the Commission further finds that—

a. It has not been positively established that a fast breeder reactor of the general type and power level proposed by Applicant can be *operated* without a credible possibility of releasing significant quantities of fission products to the environment;

b. There is reasonable assurance that theoretical and experimental investigations which have been undertaken, together with operating

[7019]

experience on one or more of the EBR-I, EBR-II and Dounreay reactors, will establish definitively, prior to the scheduled completion date of the PRDC reactor, whether or not the reactor proposed by Applicant can be so operated;

c. There is reasonable assurance that evidence will establish that the reactor proposed by Applicant can be so operated.

19. The proposed site is located on the shore of Lake Erie about thirty miles from Detroit, Michigan, twenty-five miles from Toledo, Ohio, seven and one-half miles from Monroe, Michigan, and ten miles from the Canadian border. The site is bordered on one side by water and provides an exclusion area on the land side with a minimum radius of

2900 feet. The population distribution for given distances from the site is as follows:

<i>Miles</i>	<i>Population</i>
1	175
2	600
5	1,800
10	31,300
20	187,100
30	2,001,700

- During the summer months the population within five miles would be increased due to vacationing transients, and to the fact that beaches two to five miles southwest of the site may be crowded with thousands of people.

20. There is reasonable assurance that the site is satisfactory from structural and underground water flow stand-

[7020]

points. The meteorology of the site is complex, but no reason appears in the record for it to be disqualifying. Studies of the meteorology, lake currents, air diffusion, flooding and similar problems will be completed before the question of a license to operate is before the Commission. Design modifications required by the results of those studies will be considered at that time.

21. A definitive evaluation of the suitability of the proposed reactor depends upon the inherent safety of the reactor and a demonstration that no credible accident can release significant quantities of fission products into the atmosphere. If the foregoing are established, and there

is reasonable assurance that they can be, the site will prove suitable for the proposed reactor.

22. The Commission finds reasonable assurance in the record, for the purposes of this provisional construction permit, that a utilization facility of the general type proposed in the PRDC Application and amendments thereto can be constructed and operated at the location without undue risk to the health and safety of the public.

23. Applicant's current estimate for the cost of construction, pre-construction research and development, and administrative expenses during construction and test operation is \$44,020,000. It has assets, consisting of firm commitments for contributions from members and an executed bank loan agreement, totalling \$49,448,000 and thus exceeding its estimated costs by

[7021]

\$5,428,000. There is reasonable assurance that the member companies of PRDC could provide additional funds, if necessary, to take care of adverse contingencies. Applicant's utility members have combined equity assets of \$2 billion.

24. There is a likelihood of a cost over-run on construction and research and development, and increases have already occurred on specific items. The record, however, does not demonstrate that such an over-run will exceed Applicant's available assets by any amount and especially by an amount large enough to disprove PRDC's financial qualification.

25. Provision is made in Applicant's cost estimates for payment of Commission charges for use and burn-up of source and depleted material. The amount of possible Commission charge for loss of depleted and special nuclear material has not been identified and will depend on determination of the magnitude and consequences of the maximum credible accident. Applicant believes that in any accident a substantial part of the material would be reclaimable and that its exposure to a charge for loss is on the order of \$1 million. It expects to cover its potential liability for loss by either insurance, application of its unencumbered assets, or a guarantee from its sponsors. The Commission finds that Applicant has shown reasonable assurance of being able to pay Commission charges for loss of special nuclear material through 1963.

26. The fast breeder reactor is one of the promising types for the development of electric power on a commercially feasible basis. Demonstration of the economic practicability of breeding

[7022]

would increase by many times the available reserves of nuclear fuel by facilitating the conversion into plutonium and use as fuel the Uranium-238 isotope which comprises 99.3% of the natural uranium.

27. By proceeding with construction and further research and development simultaneously, rather than awaiting complete research and development results, Applicant will save several years in the time required to place in operation its demonstration power reactor.

28. The proposed reactor will be a utilization facility within the meaning of 10 C. F. R. § 50.2(b) and will be involved in the conduct of research and development activities leading to the demonstration of the practical value of such facilities for industrial and commercial purposes.

29. Applicant and the organizations with which it is associated by contract are technically qualified to design and construct the reactor described in the Application.

30. For the purposes of a provisional construction permit, there is reasonable assurance that a reactor of the general type described in the Application can be so designed that no credible accident in the course of its operation is likely to result in the release of significant quantities of fission products into the atmosphere.

31. There is reasonable assurance that theoretical and experimental programs under way will develop sufficient data to justify the issuance of an operating license, and that the

[7023]

results of these programs will be available prior to the time it is necessary for the Commission to rule on the operating aspect of the PRDC license Application.

32. There is reasonable assurance that the proposed site is generally suitable for a reactor of the type and size described in the Application. If the reactor is otherwise shown to be capable of operation without undue risk to the public health and safety, including demonstrations of stability and adequate containment. Adequate investi-

gations are under way to establish the characteristics of the proposed site, including all relevant aspects with respect thereto.

33. There is reasonable assurance that technical information omitted from the Application and required to complete the Application will be supplied prior to the time when it is necessary for the Commission to rule on the operating aspect of the license Application.

34. For the purposes of a provisional construction permit, there is reasonable assurance that the Applicant is financially qualified to engage in the construction and operation of the reactor described in the Application and to receive the allocation of special nuclear material therefor.

35. The issuance of a provisional construction permit to the Applicant will not be inimical to the common defense and security or to the health and safety of the public.

36. The public interest required the establishment of procedures for continuing review of the PRDC project, as provided in our Order dated December 10, 1958, amended this date, so as to require both PRDC and the separated staff of the AEC, and to permit the

[7024]

Intervenors in this proceeding, to submit to all participants in the proceeding, as well as file with the Secretary of the Commission, where they will be publicly available, data coming to the attention of any one of them, pertinent to safety in construction, design and operating

characteristics of fast breeder nuclear reactors similar or identical to the PRDC project, thus to enable the Commission to consider such data and to provide for a further hearing in this instant matter, if deemed advisable prior to the final license proceeding. It is not anticipated that a hearing would be advisable or necessary upon the filing of each portion of data, but when any single filing itself or the accumulation of data filed warrants, the Commission intends on either its own motion or the motion of one of the participants to set a hearing to provide for further review of safety considerations.

37. Proceedings for a license to *operate* the proposed PRDC plant shall be held at a time later to be determined, after the completion of construction. In that proceeding the safety and financial considerations of the PRDC project will be in issue, and we shall again consider whether the PRDC plant can be *operated* with reasonable assurance for the protection of the health and safety of the public.

Chairman John A. McCone and Commissioner Willard F. Libby did not participate in the consideration or decision in this case.

HAROLD S. VANCE,
Commissioner.

JOHN F. FLOBERG,
Commissioner.

JOHN S. GRAHAM,
Commissioner.

[7025]

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

In the Matter
of
POWER REACTOR DEVELOPMENT COMPANY.

Docket No. F-16.

ORDER

On the basis of the Opinion and Final Decision adopted this date in the above-entitled cause, the Commission hereby orders that:

A. The construction permit heretofore issued to Power Reactor Development Company on August 4, 1956, is hereby affirmed and continued in effect with such modifications and additions as are shown in the permit hereto attached and made a part of this Order.

B. The amendments to its Application filed by PRDC after the issuance of the provisional construction permit on August 4, 1956, are added to and incorporated in the record.

C. By Order of the Commission dated December 10, 1958, procedure was established for continuing review of the safety characteristics of the PRDC fast breeder nuclear reactor plant. Pursuant to said Order and the construc-

tion permit as amended December 10, 1958, and this date, PRDC and the separated staff of this Commission are directed, and any Intervenor herein is permitted, to serve upon all participants herein and to file with the Secretary of this Commission, who will make them publicly

[7026]

available to anyone concerned, data pertinent to the safety in construction, design, and operating characteristics of fast breeder nuclear reactors similar or identical to PRDC project so as to permit review by the Commission, which may set down for hearing, when deemed advisable, the further consideration of such data.

D. This order shall be made immediately effective.

WOODFORD B. McCOOL
Secretary

DATED: May 26, 1959

SEAL

[7027]

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

In the Matter
of
POWER REACTOR DEVELOPMENT COMPANY

Docket No. F-16.

CONSTRUCTION PERMIT AS AMENDED

The Construction Permit heretofore issued in this proceeding, as amended December 10, 1958, is further amended this date to read as follows:

Pursuant to the Atomic Energy Act of 1954, as amended, and Title 10, C. F. R. Chapter 1, Part 50, "Licensing of Production and Utilization Facilities", the Commission hereby issues a provisional construction permit to Power Reactor Development Company, a Michigan corporation (hereinafter PRDC), to construct the facility described herein as a utilization facility in accordance with the Application and amendments thereto filed in this docket. This permit shall be deemed to contain and be subject to the conditions specified in Sections 50.54 and 50.55 of said regulations; is subject to all applicable provisions of the Atomic Energy Act of 1954, as amended, and rules, regulations and orders of the Atomic Energy Commission now or hereafter in effect; and is subject to any additional conditions specified or incorporated below:

[7028]

A. The earliest date for completion of the facility is December 15, 1959. The latest date for completion of the facility is December 15, 1960. The term "completion date" as used herein means the date on which the construction of the reactor is completed except for the introduction of the fuel material.

B. The site proposed for the facility is the location known as Lagoon Beach, Monroe County, Michigan, described in the Application.

C. The general type of facility authorized for construction is an enriched uranium-fueled, sodium cooled fast neutron breeder reactor designed to produce approximately 100,000 kilowatts of electrical energy, with associated structures, as described in the Application, and the amendments filed thereto.

D. The Applicant may proceed to design and construct the proposed facility without further authorization in accordance with the Application and the amendments thereto filed in this proceeding and heretofore made a part of the record herein. This permit, however, does not constitute final approval of any technical specification of the facility. Before a license is issued to operate the facility, the Commission must finally approve all technical specifications. If the Applicant desires any final approval of any particular specification prior to the issuance of a license to operate, it may request that the Commission grant specific approval of any specification by appropriate amendment to this permit.

[7029]

E. In accordance with the time schedule established in Paragraph E of the construction permit as amended on December 10, 1958, namely, within three (3) months from December 10, 1958, and at three-month intervals thereafter, or less if in its judgment significant changes or developments have occurred, Applicant shall continue to submit, under oath or affirmation, reports showing—

1. The status of technical investigations being conducted by or for PRDC on the following subjects, and any results obtained therefrom:

a. stability of fast reactors, including autocatalytic and resonance effects;

b. revised temperature and power coefficients of the proposed PRDC reactor;

c. validity of oscillator technique to determine either of the foregoing;

d. possibility and consequences of meltdown of a core of a fast reactor;

e. adequacy of containment proposed for PRDC reactor, including missile effects;

f. meteorology, hydrology, lake current and flooding studies, and other significant environmental information concerning the proposed site;

g. analysis of maximum credible accident.

[7030]

2. Decisions made by Applicant as to any design changes referred to in the written testimony in this proceeding, and any other design changes of the facility significantly affecting public safety;

3. Status of construction of the project, scheduled dates of design freezes on major plant components, and any changes in scheduled completion date.

F. In accordance with the time schedule established in Paragraph F of the construction permit as amended on December 10, 1958, namely, within six (6) months from December 10, 1958, and at six-month intervals thereafter, Applicant shall continue to submit reports, under oath or affirmation, showing financial statements of PRDC and APDA, current cost estimates for construction and research and development in connection with the project, and a current statement of source and allocation of cash during a ten-year operating period.

This permit is provisional to the extent that a license authorizing operation of the facility will not be issued by the Commission unless PRDC has submitted to the Commission (by proposed amendment to the Application) the complete, final Hazards Summary Report (portions of which may be submitted and evaluated from time to time), and the Commission has found that the final design provides reasonable assurance that the health and safety of the public will not be endangered by operation of the facility in accordance with the specified procedures.

[7031]

It is further provisional to the extent that the Commission reserves jurisdiction, at any time prior to issuance of an operating license, upon notice to the parties herein, to reopen this proceeding for the purpose of receiving additional evidence, and to make such determinations and take such action with respect to the continuance, vacation, or modification of this permit as the entire record warrants.

Upon completion (as defined in Paragraph A above) of the construction of the facility in accordance with the terms and conditions of this permit, as amended, upon the filing of any additional information needed to bring the original Application up to date, upon filing of proof of financial protection and execution of an indemnity agreement as required by Section 170 of the Act and 10 C. F. R. Part 140, upon a finding that the facility authorized has been constructed in conformity with the Application as amended and in conformity with the provisions of the Act and the rules and regulations of the Commission, and upon a further finding, after conclusion of additional proceedings, if they be necessary or appropriate, of reasonable assurance of safety of operation, the Commission will consider the issuance of a license to PRDC pursuant to Section 104b. of the Act, which license will, if issued, expire August 4, 1981.

Pursuant to Section 50.50 of the regulations in 10 C. F. R., Chapter 1, Part 50, the Commission has allocated to PRDC for use in connection with the reactor, 3,117.35 kilograms of Uranium-235

[7032]

contained in uranium at the isotopic ratios specified in PRDC's Application for the license. Estimate schedules of special nuclear material transfers to PRDC and returns to the Commission are contained in Appendix "A" which is attached hereto. Shipments by the Commission to PRDC in accordance with column 2 of Appendix "A" will be conditioned upon PRDC's return to the Commission of material substantially in accordance with column 3 of Appendix "A".

[7033]

APPENDIX "A"

TO

POWER REACTOR DEVELOPMENT COMPANY

CONSTRUCTION PERMIT

ESTIMATE SCHEDULE OF TRANSFERS OF SPECIAL NUCLEAR

MATERIAL FROM THE COMMISSION TO PRDC AND

TO THE COMMISSION FROM PRDC:

(1) Date of Transfer (Calendar Year)	(2) Transfers from AEC to PRDC Kgs. U-235	Returns by PRDC to AEC Kilograms U-235 Recoverable Scrap	Spent Fuel	Net Yearly Distribution Kgs. U-235	Cumulative Distribution Kgs. U-235
1958	673.19	134.57	—	538.62	538.62
1959	—	—	—	—	—
1960	436.43	87.21	—	349.22	887.84
1961	969.03	193.64	572.29	203.10	1,090.94
1962	887.65	177.39	795.45	(85.19)	1,005.75
1963	1,346.30	269.06	765.88	311.36	1,317.11
1964	1,109.59	221.75	915.95	(28.11)	1,289.00
1965	1,050.41	209.93	758.61	81.87	1,370.87
1966	1,257.53	251.32	780.88	225.33	1,596.20
1967	909.85	181.82	735.77	(7.74)	1,588.46
1968	1,109.59	221.75	778.03	109.81	1,698.27
1969	1,331.48	266.09	839.06	226.39	1,924.66
1970	1,139.18	227.66	838.43	73.09	1,997.75
1971	1,109.59	221.75	776.47	111.37	2,109.12
1972	1,272.32	254.26	776.90	241.16	2,350.28
1973	1,198.34	239.49	890.32	68.53	2,418.81
1974	1,257.53	251.32	781.39	224.82	2,643.63
1975	1,124.36	224.69	735.45	164.22	2,807.85
1976	1,198.34	239.49	839.01	119.84	2,927.69
1977	1,168.78	233.58	776.55	158.65	3,086.34
1978	1,139.18	227.66	955.33	(43.81)	3,042.53
1979	1,257.53	251.32	931.39	74.82	3,117.35
1980	909.85	181.82	735.64	(7.61)	3,109.74
1981	—	—	471.09	(471.09)	2,638.65
	23,856.05	4,767.57	16,449.83	2,638.65	